

XXII. *Some bionomic notes on British East African butterflies*, by the REV. K. ST. AUBYN ROGERS, M.A., F.E.S., of Wadham College, Oxford; *with further notes and descriptions* by PROFESSOR E. B. POULTON, D.Sc., M.A., F.R.S., etc.; *and an Appendix containing the description of new British East African forms*, by ROLAND TRIMEN, M.A., F.R.S., etc.

[Read December 4th, 1907.]

PLATES XXVI-XXIX.

CONTENTS.

	PAGE
INTRODUCTION	491
A. DANAINE-CENTRED MIMETIC COMBINATIONS .	494
I. BLACK-AND-WHITE EASTERN AMAURIS-CENTRED COMBINATIONS FROM THE COAST DISTRICT OF BRITISH EAST AFRICA	495
TABULAR STATEMENT OF MEMBERS OF BLACK-AND-WHITE AMAURIS-CENTRED COMBINATIONS CAPTURED AT RABAI, MARCH 1906-JANUARY 1907	496
(a) <i>Amauris niavius dominicanus</i> -centred Combination	497
1. <i>The Relative Abundance of the members of the Amauris niavius dominicanus</i> -centred Combination	499
(b) <i>Amauris ochlea</i> -centred Combination	499
1. <i>The Relative Abundance of the members of the Amauris ochlea</i> -centred Combination	503
2. <i>Secondary Resemblance between the Nymphaline members of the Amauris ochlea</i> -centred Combination. E. B. P.	503
(c) <i>Outlying members of the black-and-white Eastern Amauris</i> -centred Combinations	505
II. AMAURIS ECHERIA-AND-ALBIMACULATA-CENTRED COMBINATION FROM THE KIKUYU COUNTRY	509
(a) <i>Weithaga</i> members of the Combination	509
(b) <i>Nairobi</i> members of the Combination	510
(c) <i>Kijabe</i> members of the Combination	510
(d) <i>Mogoiri and Tusu</i> members of the Combination	511
1. <i>The Primary Danaine Models</i>	511
2. <i>Nymphaline Mimics</i>	511
TRANS. ENT. SOC. LOND. 1908.—PART III. (DEC.)	

(a) <i>Specimens of Neptis woodwardi from the E. of the Rift Valley compared with those from the W.</i>	E. B. P.	512
3. <i>Acræine Mimics</i>		514
(a) <i>Tabular Statement of the forms of Acræa johnstoni captured at Taita, Taveta, and Kilimanjaro, May 1904-January 1906</i>		515
4. <i>Papilionine Mimics</i>		517
5. <i>Moth Mimics.</i>		518
(a) <i>Further Notes on Moth Mimics.</i>	E. B. P.	518
III. DANAIIDA (LIMNAS) CHRYSIPPUS-CENTRED COMBINATION IN BRITISH EAST AFRICA :		
1. <i>The Primary Danaine model</i>		519
2. <i>Nymphaline Mimics</i>		520
3. <i>Acræine Mimics</i>		521
4. <i>Papilionine Mimics</i>		521
5. <i>Moth Mimics</i>		522
IV. THE ALETIS-EUPHÆDRA COMBINATION IN BRITISH EAST AFRICA		
		522
B. ACRÆA-CENTRED MIMETIC COMBINATIONS		
		522
(a) <i>A Planema-Acræa-centred Combination</i>		523
1. <i>Further Notes on Planema-Acræa Combinations.</i>	E. B. P.	523
(b) <i>Red-and-black Combination centred by large Acræas</i>		525
1. <i>Further notes on Combination centred by large red-and-black Acræas.</i>	E. B. P.	526
(c) <i>Combination of small fulvous and black Acræas from Weithaga.</i>		528
1. <i>Description of two mimetic forms of the female of Acræa alicia, E. M. Sharpe.</i>	E. B. P.	529
2. <i>The peculiar aposematic pattern of the under surface in the male Acræa alicia.</i>	E. B. P.	533
3. <i>The synaposematic upper surface pattern of Acræa alicia, uvui, etc.</i>	E. B. P.	533
(d) <i>Pardopsis punctatissima, Boisds., as a model</i>		534
1. <i>Further notes on the mimics of Pardopsis.</i>	E. B. P.	535
C. MIMETIC COMBINATIONS AMONG THE PIERINÆ.		
I. MYLOTHRIS-CENTRED COMBINATIONS		
		535
(a) <i>Mylothris agathina-centred Combination taken at Rabai</i>		535
(b) <i>Mylothris agathina-centred Combination from Kilimanjaro</i>		537
(c) <i>Mylothris-centred combination from Weithaga</i>		537

II. BELENOIS-CENTRED COMBINATION FROM TAVETA	539
1. <i>Resemblance between a female Teracolus vesta and a female Belenois severina taken together at Taveta.</i> E. B. P.	541
D. NOTES ON THE SEASONAL FORMS, ETC., OF <i>PRECIS</i> IN BRITISH EAST AFRICA	541
(a) <i>Precis sesamus</i>	542
(b) <i>Precis antilope</i>	544
(c) <i>Precis archesia, wet season form pelasgis.</i> E. B. P.	545
(d) <i>Habits of Precis natalica and P. elgiva</i>	546

APPENDIX :

<i>Description of new forms of British East African butterflies in the Hope Department, Oxford University Museum, chiefly collected by the Rev. K. St. Aubyn Rogers, by Roland Trimen</i>	547
---	-----

INTRODUCTION.

[I HAVE added to the following memoir many records of observations received in letters from the author. In most cases such notes are printed separately with the address and date of the letter in which each was contained. Occasionally the record had been cut out of the original letter and the address lost. In a few cases the statements in letters have been added to the memoir without any indication. My own notes, etc., are always clearly discriminated, and signed by my initials.

E. B. POULTON.]

These notes on the Bionomics of East African butterflies owe not merely their origin but their whole scope and character to Professor Poulton. The observations on which they are based were undertaken at his suggestion and under his guidance, and he has been good enough to work out the whole collection and to look over all the sheets of the paper, and send me the most valuable help and suggestions during its progress. In particular the tables of dates and localities of the several combinations are due entirely to him, and it is not too much to say that without his aid these notes could never have been compiled at all.

I have also to acknowledge the kind assistance of Dr. Dixey with regard to the *Pierinae*. He has continually placed at my disposal his unique knowledge of this group,

and has given me every help in tracing out the relationships of the whole series.

I propose in the first place to convey some idea of the character and seasons of the various localities. These are—

- (1) Mombasa and the Coast hills.
- (2) Taveta and Kilimanjaro.
- (3) Kikuyu.

(1) *Mombasa and the Coast hills.*

The climate of this area is typically tropical: the elevation hardly reaches 1000 ft., except in the case of single hills such as Mangea, which is 1600 ft. The air is moist and the temperature high throughout the whole year.

There are two wet seasons, lasting roughly during April–June and November–December, in the year, and the driest season is January–March, at which period the temperature is highest. It is rather singular that a family of *Belenois severina*, Cram., which was bred at Mombasa during this season belonged entirely to the wet season phase. In fact the seasonal forms of *Pierinæ* are most puzzling and unaccountable. For instance, all the specimens of *Pinacopteryx liliana*, Gr.-Sm., which I took at Taveta during the long dry season, belonged to the wet phase, whilst I took a good series of the dry phase at Mombasa at the beginning of July before the rains were over, in an exceptionally wet year.

This coast region is for the most part open cultivated country with extensive patches of woodland and some low forest. It is generally well watered at the southern end, of which Rabai is the centre. Further north it is much drier and becomes greatly parched at the end of the hot dry season; but I have not been able to do much collecting in this district. All along the coast the hills rise rapidly, leaving a narrow strip of littoral about 10 miles wide in most places. These hills do not reach a greater elevation than 1200 ft., except Mangea, which is 1600 ft. The greater part of my collecting has been done in these coast hills where the large black-and-white *Amauris*-centred combination is highly characteristic, and the important association centring round the larger red black-marked *Acraeas* is also very much in evidence.

(2) *Taveta and Kilimanjaro.*

Although these are placed together as contiguous areas they differ entirely in climate.

Taveta has a comparatively small rainfall, averaging perhaps 30 inches, of which the larger portion falls between mid-March and mid-May. The rest of the year is an almost continuous dry season, broken only by a few heavy showers in November. The day temperature is high, rising well over 90° in the hot season, and the night temperature much lower, often falling below 70° even during the hottest period of the year, whilst in the cool season it sometimes sinks to 55° . The elevation is 2500 ft.

The whole country is arid with the exception of the forest, which is well watered by springs, and occupies an area of some 10 square miles. The timber differs greatly from the lower growth near the coast; for the trees are of great size, and where they have not been cut the forest is very dense.

Kilimanjaro, on the other hand, has a large rainfall which extends over the whole year with the exception of two or three months from mid-December to mid-March. Cultivation extends up to about 6000 ft., above which there is a dense low forest as far as 8000 or 9000 ft.* In some places there are outlying patches of forest at much lower elevations, but generally speaking the country is open and well cultivated, supporting a large population. Most of my collecting was done at about 5000 ft., and I believe my native collectors worked at much the same elevation.

(3) *Kikuyu.*

The Kikuyu country, at a height of from 5000 to 8000 ft. and even higher, is also well cultivated ground. It rises from an elevated plateau and is very hilly, especially in its northern part.

I did a little collecting at Nairobi, the head-quarters of the Colonial Government, and from there went to Kijabe,

* In the sentence "I did go as far as the forest which extends upwards for about 6000 ft.," quoted from my letter by Professor Poulton in Proc. Ent. Soc. Lond., 1906, p. lix, the word "for" should be replaced by "from."

which is on the eastern slopes of the Rift Valley and a fine forest country.

Most of my collecting, however, was done in Northern Kikuyu at a place called Weithaga (6000 ft.), about 15 miles due west of Fort Hall, and perhaps 60 miles north of Nairobi.

The country consists of a series of long ridges with very steep narrow valleys between them, running down to the plain from Mount Kinangop. Most of these valleys are swampy, but they are often well cultivated, as indeed is the whole country, the population being very large and entirely dependent on agriculture. Woods are few and the whole country is very open.

I also did a little collecting at Mogoiri (6500 ft. to 8000 ft.), which is a large district to the west, at a somewhat higher elevation, rising in its western part towards the slopes of Kinangop: also at Tusu (8000 ft.), lying still further west and even higher up on Kinangop. This last locality is, in part, low forest.

The rainfall throughout this whole area is fairly high, for such a cool country, amounting to some 50 inches, and the land is never really dried up. Green grass is plentiful even during the hot dry season, so that seasonal forms are not well pronounced. I succeeded in breeding a species of *Precis*, *P. archesia*, Cram., but all my specimens were but little removed from the full wet season phase. Both forms of *Precis sesamus*, Trim., are, on the other hand, well marked and abundant.

The material illustrating all parts of this paper exists in the Hope Department of the Oxford University Museum, where the authorities will always be glad to make it available for the study of Naturalists interested in the subject of insect bionomics.

A. DANAINE-CENTRED MIMETIC COMBINATIONS.

Although, so far as I am aware, the mimetic *Papilio rex*, Oberth., has not as yet been taken in the Taveta and Taita districts, it is of interest to observe that the model, *Tirumala (Melinda) formosa*, Godm., certainly occurs there. I have had one specimen brought to me at Taveta, and on the journey from Voi to Taveta in 1905 I saw several

on Dabida Hill, although I was unable to capture any of them.

I. *Black-and-white Eastern Amauris-centred Combinations from the Coast District of British East Africa.*

This striking series of conspicuous butterflies contains two well-marked combinations, respectively grouped around *Amauris niuvius*, L., sub-sp. *dominicanus*, Trim., and round *A. ochlea*, Boisd. It also includes a number of outlying mimetic forms which have evidently been influenced by the dominant species of black and white *Amauris*, but do not resemble the pattern of any particular model.

Although the two combinations are well marked, there is a species, *Euxanthe wakefieldi*, Ward, ♀, which possesses a pattern of the *ochlea* type and yet upon the wing more closely resembles the *dominicanus* association. It is probable that the outlying species also serve to hold both combinations together and to weld them into a single complex association of black white-marked species. For this reason, the time relationships of the whole of the members of both combinations at Rabai are recorded in a single table, which shows that many of the species fly together. This diary of captures extends over the eleven months from the beginning of March 1906 to the end of January 1907.

It must be remembered that, with the exception of the specimens taken on May 12 and on September 15, no special attempt was made to capture as complete a series as possible on a single day. Furthermore, the abundant models were avoided, while rarer species, such as the *Euxanthes*, were especially sought. Hence the following diary gives a wrong idea of the proportionate abundance of the constituent species.

Allowing for this, the solid fact of the occurrence of the various members of the two combinations in the same place and at the same time is proved over and over again in the following table :—

Tabular Statement of members of Black-and-White Amauris-centred Combinations captured at Rabai, March 1906-Jan. 1907.

W = worn; C = chipped; + = greatly; - = slightly.

DATES OF CAPTURE.	DANAIDÆ.		NYMPHALINÆ.					ACRÆINÆ.			PAPILIO-NINÆ.		
	<i>Amauris niarvus</i> , sub-sp. <i>domitricanus</i> .	<i>Amauris ochlea</i> .	<i>Pseudacraea (Acraea) f. expansa</i> .	<i>Hypolimnias (Everatia) usambaræ</i> .	<i>Hypolimnias (Everatia) wahlbergi</i> .	<i>Hypolimnias (Everatia) deceptor</i> .	<i>Hypolimnias (Everatia) kiribati</i> .	<i>Euxanthe wabekfeldti</i> .	<i>Euxanthe tibetius</i> .	<i>Acraea satts</i> .	<i>Acraea eschöria</i> .	<i>Platynema aganice</i> .	<i>Papilio dardanus (merope)</i> , sub-sp. <i>f. tibullius</i> , ♀ <i>f. hippocoon</i> .
1906.													
March 3	1	...	...	...	...	...	...	...
March 31	1	...	1♂ C-	...	...	...	...	...
April 7
April 11
April 14
April 28	1	...	1♂ C-	...	...	...	...	...
May 12	1 W	Pl. XXVII, fig. 1	1 W	1 W	...	...	2♂	3♂, 1 C-	...	...	...	1♀	1♀
May 23	1♀
May 26
May 28	1♂ W-	...	...	...	...	...
June 2	2♂ W*	...	...	...
June 9	1♀
June 23	1♂ C-	...	...	...	...	1♀
June 26	1♀
July 1
July 7
July 25
Sept. 15	1♀ W- Pl. XXVI, fig. 1	...	...	1♀ C- Pl. XXVI, fig. 3	1 W-	...	...	1♂	...	...	...	...	...
Oct. 20	1♂ C+	1♂ W	...	...	...	...
Oct. 27
Nov. 3
Dec. 22	1 W, C, 1	...	...	...	...	...	...	...	...	...	...
Dec. 29	Pl. XXVII, fig. 4	...	...	...	...	1♂ C- Pl. XXVII, fig. 2	...	...	...	1♀ C-	...
1907.													
Jan. 5
Jan. 19	♂♀ in cop. the ♂ W+	...	...	...	...	...
Jan. 19	Pl. XXVII, fig. 3	...	...	...	...	...
Jan. 26	1♀ W, C-	...	...	...	...	...

* One with ochreous markings, the other ochreous, becoming fulvous, especially in the largest marking.

a. *Amauris niavius dominicanus*-centred Combination.

This well-marked combination contains, in addition to the Danaine model, the following species, of which all except *Euxanthe wakefieldi*, Ward, ♀, are beautiful mimics. The pattern of this latter is indeed rather that of the *ochlea*-centred combination, with which it is represented on Plate XXVII, fig. 2. In the living state however, in spite of its pattern, the female of *Euxanthe wakefieldi* is more closely allied to the larger more broadly white-marked combination of *Amauris niavius dominicanus*, well shown on Plate XXVI.

NYMPHALINÆ. *Hypolimnas* (*Euralia*) *usambara*, Ward.
Hypolimnas (*Euralia*) *wahlbergi*, Wallgr.
Euxanthe wakefieldi, Ward, ♀.

PAPILIONINÆ. *Papilio dardanus*, Brown, sub-sp. *tibullus*,
 Kirb., ♀ f. *hippocoon*, F.

Amauris niavius, L., sub-sp. *dominicanus*, Trim.† (Plate XXVI, fig. 1). The central model of this association is very common in shady places, and sometimes extremely abundant; whilst its broad black and white markings make it very conspicuous.

[*Rabai*, May 1, 1906. *A. dominicanus* can almost always be distinguished even on the wing from *H. wahlbergi* and *P. dardanus*. *Wahlbergi* is almost destitute of marginal white spots and so the black and white look much more distinct; whilst *P. dardanus* has this marginal series much more developed than the model.]

Euralia (*Hypolimnas*) *usambara*, Ward (Plate XXVI, fig. 3), is the largest member of the combination, and, in spite of considerable differences in details of coloration, strongly resembles *Euxanthe wakefieldi* ♀ on the wing, when the bright, orange-brown border on the under side of the hind-wings somewhat detracts from its apparent size. As far as my experience goes it is by far the rarest species of the combination and I have only met with it in one locality at Rabai.

[*Rabai*, September 12, 1908. I have taken two more specimens of *Euralia usambara* a week ago. I must confess that the first took me in completely. It was hovering over the end of a branch quite in the manner of the *Amauris* model, for which I mistook it, and was just considering whether I should catch it for my spiders, when it

settled and I saw what it was. Another appeared on the scene soon afterwards.]

Euralia (Hypolimnas) wahlbergi, Wallgr. (Plate XXVI, fig. 4), is common, and is, like the *Amauris*, a denizen of woods and forests, but its habits are somewhat different. It prefers the more open parts of the woods and generally sits on the upper side of leaves and thence pursues butterflies of its own and other species; but it not unfrequently may be seen resting with its wings hanging down in a position entirely similar to that of *dominicanus*, and such is probably its usual position of rest at night. It is quite possible that this attitude is of great importance in the struggle for existence, and I would offer the suggestion that the period of nocturnal rest may be far more dangerous to many species than the more active period of the day, when, to judge from the rarity of observed attacks by birds, most butterflies are quite able to take care of themselves. The period of rest, however, begins for butterflies at a time of the day when birds are most active in the pursuit of food, whereas the butterflies are quiescent and would, if discovered, fall an easy prey to their enemies. This principle has also been observed to be in operation in Siam by Mr. N. Annandale,* and in South Africa by Dr. G. B. Longstaff.†

Euxanthe wakefieldi, Ward, ♀ (Plate XXVII, fig. 2). The males of this species do not really come into the association at all, but the female is largely modified in the direction of the *Amauris* by the increased size of all the pale spots and areas, and also by their colour, which is much lighter and whiter in tint, so that on the wing the butterfly appears to be simply black and white. This resemblance is greatly increased by the shape of the wings as compared with those of its own male, which has the fore-wings exceedingly short and broad,—so much so as to give it a very distinctive appearance, especially in flight. On the other hand, the wings in the female are much produced so as to approximate in shape to those of the primary model. During flight this female bears an even closer resemblance to the Papilionine co-mimic, shown on Plate XXVI, fig. 2, than to the Danaïne model (Fig. 1), especially in the prominently spotted dark border of the hind-wing. In habits *E. wakefieldi* resembles more closely

* Proc. Roy. Phys. Soc. Edinb., 1900, No. xxix, pp. 439-44.

† Trans. Ent. Soc. Lond., 1906, p. 118.

the species of *Euralia*, being generally seen sitting on the outer leaves of trees, and the males being very fond of pursuing each other with great activity. It is, however, frequently to be found at rest on tree-trunks, and I have observed the female settled with its wings pendent, and in this position bearing a very strong resemblance to the Danaine model. I have little doubt that this species is specially protected and a Müllerian mimic. The facts stated about the allied *E. tiberius* (p. 501) are equally true of *wakefieldi*.

[Taveta, July 5, 1905. They are very fond of chasing each other round and round and have a very graceful floating flight, which no doubt accounts for their becoming mimics of *A. dominicanus*, of which the flight is somewhat similar. The male generally settles on tree trunks, but I have seen the female more than once settle on a branch or twig with its wings hanging down exactly after the manner of *A. dominicanus*, to which it bears a strong resemblance on the wing.]

Papilio dardanus, Brown, sub-sp. *tibullus*, Kirby, female form *hippocoon*, F. (Plate XXVI, fig. 2). This is by far the commonest form of the female and is of very frequent occurrence. It is readily distinguished during flight by the prominent sub-marginal spots in the dark border of the hind-wing. I have met with this form in some abundance as far away as Nairobi in the Kikuyu country, and it remains the dominant variety of the female from this locality westward to the Atlantic coast.

1. *The Relative Abundance of the members of the Amauris niavius dominicanus-centred Combination.*

In my experience *Euralia usambara* is the only really rare member of the association, and the only one with a restricted range. All the other constituent species have a considerable range in the Coast district. The relative abundance of the different species varies considerably in different localities. At Taveta, for instance, the primary model, *A. niavius dominicanus*, outnumbered many times all the others; while at Rabai its dominance was by no means so well marked.

b. *Amauris ochlea-centred Combination.*

In addition to the Danaine model this combination contains the following species, of which all except *Euxanthe*
TRANS. ENT. SOC. LOND. 1908.—PART III. (DEC.) 33

tiberius ♀ are fairly good mimics. This combination is however more distinguished than that last described by the strength and beauty of the secondary mimetic resemblances. The model and chief Nymphaline mimics are well seen, represented $\frac{5}{8}$ of the natural size, on Plate XXVII. The plate includes the female of *Euxanthe wakefieldi* (Fig. 2) with a pattern resembling that of this combination, but in life an outlying member of the association with *A. dominicanus* for its centre.

NYPHALINÆ. *Pseudacræa lucretia*, Cram., sub-sp. *expansa*, Butl. (Plate XXVII, fig. 4).
Euralia deceptor, Trim. (Fig. 6).
Euralia kirbyi, Butl. (Fig. 5).
Euxanthe tiberius, Gr.-Sm., ♀ (Fig. 3).
Aterica galene, Brown (white f. of ♀).

Amauris ochlea, Boisd. (Plate XXVII, fig. 1). The habits of the central model of this association are quite like those of *A. niavius dominicanus*, except that it is a little more partial to the open country, and is fonder of flowers.

Pseudacra lucretia, Cram., sub-sp. *expansa*, Butl. (Plate XXVII, fig. 4). This species often settles on leaves with wings expanded, and in every way it has much more the appearance of a large *Neptis* than any of the other members of the combination. Although the pattern of this species so closely resembles that of the two *Euralias* the *Pseudacræa* appears whiter on the wing and has a more floating flight. It is possible that the characteristic curve of the large spots of the fore-wing, to which Professor Poulton has drawn attention, has been influenced by the curved band in the fore-wing so well marked in this genus, of which *N. agatha* is a good example. I have only seen the species near Rabai.

Euralia deceptor, Trim. (Plate XXVII, fig. 6), and *E. kirbyi*, Butl. (Fig. 5). The two *Euralias* resemble one another strongly, especially on the wing, and are active insects very fond of pursuing butterflies of their own and other species. I have little doubt, however, that in the position of permanent rest they would follow the Danaine model, and in fact I have observed *E. deceptor* in this attitude.

[*Mombasa*, April 5, 1905. I have only seen *Pseudacræa expansa* near Rabai, and *Hypolimnias (Euralia) deceptor* and

wahlbergi I have only taken in the same district, i. e. on the Coast hills. *H. deceptor* is not uncommon, but it is very difficult to get in good condition.]

[*Rabai*, May 1, 1906. The first specimen of *H. deceptor* I ever captured was settled with its wings hanging down just like *ochlea*, but I have never observed this since and I have seen dozens of the species. It is very fond of settling on the outer leaves of small trees and chasing its companions from time to time, and on the wing is not at all unlike *H. misippus*.]

[*Euralia kirbyi* is included in the observations on *E. deceptor* recorded in the above extracts from two letters. The two species, which are extraordinarily alike, were not at first discriminated. E. B. P.]

[*Rabai*, May 9, 1908. I saw a good many *Euralia deceptor* and *kirbyi* last Saturday, which was a fine day after rains earlier in the week, but they were mostly in bad condition and the better specimens were flying high. I also caught two or three *Euxanthe wakefieldi*, but they were none of them perfect, and I did not keep any.]

Euxanthe tiberius, Gr.-Sm., ♀ (Plate XXVII, fig. 3). The female of this species should also be included in the combination, although the male is very distinct. It is true, however, that the conspicuous fulvous patch on the inner part of the fore-wing at once distinguishes the female from all the other members, and is a prominent feature even on the wing. The development of the white patch on the hind-wings is the more striking because of its total absence in the male. As a further mimetic modification of the female, all the pale spots in the fore-wing are larger and whiter than in the male. I am strongly of the opinion that *E. tiberius* itself must be regarded as a protected species and a Müllerian mimic. Unless thoroughly disturbed, it is a very sluggish insect and is most conspicuous on the wing, especially in the deep shade which it loves. It is true that the texture of the wings is much softer and more readily torn than that of species like *A. niavius dominicanus* and *ochlea*, but the body is extremely tough, and I have found it exceedingly difficult to kill by pressure between the finger and thumb,—even more so than *Danaïda (Limnas) chrysippus*, L.

[*Rabai*, May 1, 1906. I have captured a fine *Euxanthe [E. tiberius]* which is quite new to me. This was a great surprise, as I have worked this district pretty hard, and

it is not an insect one would be likely to pass over. I have taken in all three specimens which I send you, two of them being not quite perfect, whilst the third is as good a specimen as one could wish for. All three were taken in the same locality, on the site of the old capital of the Rabai tribe (called *New Rabai*), which has long been deserted, though it is still resorted to for sacrifices and other superstitious practices. All three specimens were taken in deep shade, and its flight seems heavy and feeble, but as, in each case, I captured the specimen at first sight I cannot say whether it would prove more active if it were alarmed. I should say that this locality occupies the top of a high hill just opposite the present town of Rabai, with a deep ravine between, whilst on the other side there is a precipitous descent of about 700 ft. almost to sea-level. It is in part covered with forest and seems a splendid locality.]

[*Rabai*, July 29, 1906. All the specimens of *E. tiberius* but one have been taken in almost exactly the same spot. During the daytime it rests on trees with its wings upright, and if alarmed goes off at a good rate, and dodging amongst the trees is soon lost to sight; but it seems to be an insect of sluggish habits, and I have never seen them sporting together in the manner of *E. wakefieldi*. I took one specimen which had evidently retired for the night resting on the under side of a leaf with its wings hanging down.]

[*Rabai*, May 9, 1908. The dry hot weather lasted on till the middle of April when all insects were rather scarce. It was noticeable that *Euxanthe tiberius* was much more wary and difficult to take than usual during this time. When on the alert it has a provoking habit of going off in the forest and settling on a tree-trunk some 20 or 30 yards away, and then when you stalk it with great care it waits till you are nearly within reach and then goes off and repeats the performance.]

Aterica galene, Brown, ♀, may also be associated with this among other combinations. The species is common in woodland and forest areas on the Coast hills, where the intense light and shade make it anything but conspicuous when settled on the ground. The colour of the pale patch on the hind-wing of the female varies considerably, being sometimes white. The individuals with an ochreous patch fall naturally into the *Amecuris echeriu* and *albimaculata*

centred combination (see pp. 511, 512). The under side is of course procrystic, so that it can hardly be regarded as a distasteful insect. Professor Poulton has pointed out (see p. 505) that there are certain features in the markings of the fore-wing which are apparently secondarily associated with the *Pseudacræa* and *Euraliæ* of this combination.

1. *The Relative Abundance of the members of the Amauris ochlea-centred Combination.*

The relative abundance of the members of this combination varies a good deal in different localities and stations, as was seen to be the case with regard to the *A. niavius dominicanus* combination. At Rabai the two *Euralias* predominate in the wooded country, and are even more in evidence than the primary model, whilst on a tour further north in the Giriyama country I found *P. lucretia expansa* the most numerous member, especially at Mangea.*

[Rabai, August 29, 1908. I am sending you two *Euralia kirbyi* and one *Pseudacræa lucretia*, taken in Dida Forest, which is a large area of low dense forest, a little south of Kaembeni on the way to Jilore. The *Euralia* was quite common, and I netted other specimens which were not good enough to keep, but for the whole distance, some 8 miles, I never saw *Amauris ochlea* at all. In fact, I have found that both the *Amauris* are more local than the *Euralias*, though very abundant in places. Moreover, I have seldom seen them flying with either the *Euralia* or the *Pseudacræa*, which is of considerable interest in view of the fact that the mimics resemble each other more closely in some respects than either does the primary Danaine model.]

2. *Secondary Resemblance between the Nymphaline members of the Amauris ochlea-centred Combination.* E. B. P.

I have been much struck with the apparently strong secondary likeness between *Pseudacræa lucretia expansa*, *Euralia deceptor*, and *E. kirbyi* so often taken by the

* [A considerable number of the members of this and the *dominicanus*-centred combination from Coast localities N. of Rabai, and also from Taveta, and a few from Taita and Kilimanjaro, have been presented by the author to the Hope Department. It has not been thought necessary to tabulate them in view of the more complete records from Rabai printed on p. 496; but it is well to point out that these specimens from additional localities also afford strong evidence that the species occur at the same places and are often seen upon the wing together. E. B. P.]

author in the same locality and on the same or nearly the same date. The two *Euralias* are so much alike in pattern that they might easily be mistaken even in the cabinet, while their resemblance to the pattern of the *Pseudacræa* is also very marked. There can be little doubt that this is not an incidental result of resemblance to the same Danaine model, but that it is a genuine case of secondary mimicry. The most characteristic element in the pattern of the *Pseudacræa* is a curved series of white spots crossing the fore-wing and forming together a marking which suggests a thick "comma." The concave side of the curve is directed towards the base of the wing, and the point of the "comma" rests in the cell. This well-marked feature occupies nearly the position and is mimetic of the chief white marking in the fore-wing of *Amauris ochlea*. It is, however, of a more peculiar and characteristic shape in the mimetic *Pseudacræa*, and the two *Euralias* which resemble it, than in the model. Hence there can be little doubt about the existence of a true secondary approach between these representatives of the two Nymphaline genera. The question furthermore arises as to whether *Pseudacræa* or *Euralia* has acted as the model. Although all three species appear to be common in the neighbourhood of Rabai, it is probable that *Pseudacræa lucretia expansa* is the model followed by its Nymphaline co-mimics. The secondary resemblances described above are well shown in Figs. 4-6 of Plate XXVII. The peculiar marking, with some modification, occurs in other sub-species of *lucretia*, between them covering a very wide range—in *tarquinia*, Trim., of the south-east; in the abundant form (with points of resemblance to both *tarquinia* and *expansa*) from the N.E. of the Victoria Nyanza; and in *lucretia lucretia* of the West Coast. The two *Euralias* have a far more limited distribution, being apparently confined to areas where the marking reaches its most characteristic development in the *Pseudacræa*. There is no doubt, as the author pointed out to me, when we were studying the Hope Collection together, that the central markings in the fore-wing of *Euralia dubius*, Pal. (neighbourhood of the Victoria Nyanza to the W. Coast), tend to exhibit a peculiar curve which may indicate affinity with *E. deceptor* rather than the usually accepted affinity with *E. mima*,* Trim., but the relation-

* Upon the under surface, *Euralia dubius* appears to resemble *E. mima* much more closely than it does *E. deceptor* and *E. kirbyi*.

ship between the markings does not support the conclusion that the feature is primitive in the Euralias. In fact *E. dubius* has itself been so strongly modified by mimicry of western species of *Amauris*, that the marking under consideration usually exhibits only a slight although recognisable resemblance to that of *E. deceptor* and *E. kirbyi*.

The peculiar curve in the chief band of white spots crossing the wing of the female *Euxanthe tiberius* (shown on Plate XXVII, fig. 3) has also probably been produced by secondary mimicry either of the *Pseudacræa* or the *Euralia* which occur in the same locality. The case of the widespread Nymphaline *Aterica galene* with its variable female is more puzzling. But here also we find in both sexes and in all forms of the female the same peculiar curve in the chief band of pale spots crossing the fore-wing. If this marking has been affected by secondary mimicry the species has at any rate carried it far away from the area where the most characteristic development is reached by the model. This however would not be the only example of *A. galene* ranging beyond its model. Thus it is shown on p. 512 that the *Amauris echeria*-and-*albimaculata*-like form of the female—and in this case the mimetic resemblance cannot be doubted—occurs in localities near Mombasa, where its Danaine model is unknown. The two dark spots (generally fused in male, often in female, occasionally very minute or perhaps altogether wanting) in the cell of the hind-wing under side may possibly indicate resemblance to the well-known group of spots occupying this position in the *Pseudacræa*. E. B. P.

c. *Outlying members of the Black-and-White Eastern
Amauris-centred Combinations.*

Nymphalinx. Mr. G. A. K. Marshall has shown that the African species of the genus *Neptis* have certain features which indicate that they should be regarded as outlying members of this large and complex combination. He has also brought forward evidence which points to the conclusion that they are themselves distasteful. There are three species of this genus which I have taken commonly:—*N. agatha*, Stoll.; *N. marpessa*, Hopff., and *N. melicerta*, Drury. All these have a wide distribution and are commonly met with. The most abundant species is *N. agatha*, and there is no doubt that, in the distribution of its black

and white markings, it approaches most nearly to the central members of the group. Moreover it is extremely variable in size, some of the largest females nearly equaling *Amauris ochlea*, whilst the smallest males are no larger than average specimens of *marpessa* and *melicerta*. The species of *Neptis* are very conspicuous on the wing and have a leisurely floating flight, but they are very active and are not taken nearly so easily as one would be led to expect.

Besides these three species of *Neptis* we have two species of another Nymphaline genus which strongly resemble them, i. e. *Neptidopsis ophione*, Cram., and *N. fulgurata*, Boisd., sub-sp. *platyptera*, Rothsch. and Jord. Now although these belong to a genus so distinct in structure, being in fact *Eurytelids*, yet during life they bear a very strong resemblance to the genus *Neptis* both in appearance and in habits. *N. ophione* is certainly an abundant species, and I should regard *N. fulgurata platyptera* as quite common, though, as far as my experience goes, its range is far more restricted.

Associated with these species of *Neptis* I should place a most interesting Lycænid, *Alæna picata*, E. M. Sharpe, which departs widely from the style of colouring usual in the family, and assumes the strongly contrasted black and white markings characteristic of this great combination. This species is not common, but I think it possible that it may frequently be overlooked on account of its strong resemblance to a small *Neptis*. It is true that the details of pattern differ somewhat from those of any species of the genus *Neptis* with which I am acquainted, but I have found the Lycænid very difficult to distinguish on the wing. Its flight is even more feeble and may exhibit something of the "floating" appearance of *Neptis*, while it frequents exactly the same localities: even in size it approaches the smaller specimens of e. g. *N. melicerta*. Moreover, the genus *Alæna* has been shown by Mr. G. A. K. Marshall to be in all probability distasteful, and this renders it likely that the species is a Müllerian member of the combination.

[Rabai, May 1, 1906.]

This species [*A. picata*] when taking its longer flights looks almost like a moth, moving its wings with considerable rapidity.]

[Address and date lost.

This Lycænid [*A. picata*] bears a curious resemblance to a small *Neptis*, but its flight is much more feeble and the "floating" character much less pronounced, so that it is generally recognisable although with difficulty. It also rests, as do most of its allies, with its wings hanging down, which at once betrays it.]

Before leaving *Neptis* it would be as well to refer to another species of the same genus, *N. incongrua*, Butl., which has the same contrasted black and white markings distributed in a manner different from that of Ethiopian species generally. Its peculiar pattern produces a close resemblance to *Eurytela hiarbas*, Drury, which is found in the same localities. The first specimen of *N. incongrua* which I captured quite deceived me, and it was not until I had the butterfly in the net that I discovered that it was not *E. hiarbas*. Now that I am better acquainted with both species it is not likely that I should make any such mistake even when the insects were on the wing, but there is no doubt that the resemblance is more than accidental. Mr. Marshall has recognised the resemblance of an allied species of *Neptis* in S.E. Rhodesia to *Eurytela hiarbas*.*

Acræinæ. There are also the females of two large abundant *Acræinæ* which, with their mimics, should, no doubt, be looked upon as outlying members of this combination. The general effect of their pattern certainly suggests that of the black and white species of *Amauris*, although, as in the genus *Neptis*, the details of the marking are obviously different. The central species of this

* Before leaving the *Nymphalinx* I should wish to draw attention to a possible case of mimicry in the genus *Charaxes*. Mr. G. A. K. Marshall has suggested possible cases of mimicry of one *Charaxes* by another, and I think we have a parallel example at Taveta.

When looking through the series of *C. etheocles*, Cram., at Oxford, I found that the two female specimens I took at Taveta differed from those Mr. Wiggins obtained in the region of the Victoria Nyanza in two respects, i. e. the fulvous colouring on the fore-wings was more extensive, and the white bar in the hind-wings was much narrower. In both these differences the Taveta specimens approach *C. saturnus*, Butl., and it is noteworthy that whereas *C. saturnus* was common at Taveta, yet Mr. Wiggins did not send home a single specimen from the Victoria Nyanza in his very fine series of *Charaxes* from this region.

group is the female of *Planema aganice*, Hew., form *montana*, Butler, which is found commonly in many localities in East Africa. Associated with it are the white-marked forms of the female of the common *Acræa csebria*, Hew., and of *A. carmentis*, Doubl., which I have once received from Kilimanjaro. I have also once taken the female of a *Pseudacræa*,* probably the eastern representative of the western *P. hircæ*, Drury. This white-marked female is a beautiful mimic of the female *Planema*. These three species are so similar in pattern and flight that I do not think it is possible to distinguish them on the wing. They all have the characteristic leisurely flight of the *Acræinæ*, and, from their large size and strongly contrasted black and white colouring, are distinctly suggestive of the *Amauris niavius dominicanus*-centred combination. Other mimetic resemblances of and between the males of these two common *Acræas* will be described on p. 523. They are considered with the other *Acræa*-centred combinations, because the pattern of the males does not, like that of the females, enter into a distant relationship with any of the *Amauris*-centred associations.

Another outlying member belonging to the same subfamily is the female of *Acræa satis*, Ward, which I have found not unfrequently in the Coast district, and even on Mombasa island. Here again, although the details of marking are very different, in size and colour the species certainly approaches this great black and white combination.

Pierinæ. Professor Poulton has suggested that *Gluto-phrissa saba*, Fab., ♀, should be regarded as an outlying member of the combination, but as far as my experience goes this species is always an unmistakable Pierine, and does not resemble the other members in its habits or appearance.†

Papilioninæ. I am somewhat more doubtful as to the position of *Papilio philonœe*, Ward, which certainly has a floating flight. It bears more resemblance to *Pseudacræa lucretia expansa* than to any other member of the combination, but the white areas are much more extensive and it can always be easily recognised.

* *Pseudacræa rogersi*, sp. nov. See Appendix, p. 549.

† Mr. Roland Trimen suggested in 1881 (Proc. Ent. Soc. Lond., p. vii) that the ♀ *saba* might be a mimic of the widely-spread and evidently protected African Hypsid moth, *Nyctemera apicalis*, Walk.

II. *Amauris echeria-and-albimaculata-centred Combination from the Kikuyu Country.*

My experience of this interesting combination has been chiefly derived from recent visits to the Kikuyu country, although I have also encountered it on and near Kilimanjaro. The following captures at various localities in the Kikuyu country will give some idea of the relative abundance of the models and their various mimics.

(a) *Weithaga.*

The numbers of specimens of this group taken at Weithaga have been arranged in the following tabular form by Professor Poulton.

Weithaga.	DANAINÆ. Primary model (<i>echeria</i> not taken). <i>Amauris albimaculata.</i>	NYMPHALINÆ. Mimic, with secondary resemblance to <i>Acræa johnstoni.</i> <i>Neptis woodwardi.</i>	ACRÆINÆ. Mimic. Forms of <i>Acræa johnstoni.</i>	PAPILIONINÆ. Mimic. ♀ of <i>Papilio echeurioides.</i>
1906.				
Aug. 11 . .	...	1 ♀ rather worn. Pl. XXIX, fig. 2.	...	...
Aug. 13 . .	...	1 ♂ a little worn.	1 ♂ <i>fallax</i> —worn.	...
Aug. 16 . .	2 ♂	...	1 ♂ <i>fallax</i> —worn.	...
Aug. 18 . .	...	1 ♂ worn.	1 ♂ <i>fallax.</i>	...
Aug. 22 . .	...	...	...	1 ♂
1907.				
March 9 . .	...	...	...	1 ♂
March 16 . .	1 ♂	...	1 ♂ <i>fallax</i> —worn.	...
March 30 . .	1 ♂	...	2 ♂ 1 ♀ <i>fallax.</i>	1 ♂ chipped. 1 ♀ Pl. XXVIII, fig. 4.
April 4 . .	1 ♂	...	...	...
April 5 . .	...	...	1 ♂ <i>proteina</i> —worn.	...
April 13 . .	3 ♂, 1 ♀	...	...	...
April 18 . .	...	1 ♂ chipped.	...	...
April 20 . .	1 ♂	...	...	...
May 10 . .	...	1 ♂ a little worn. Pl. XXIX, fig. 1.	...	...
May 11 . .	1 ♂, 1 ♀	...	...	...

Unnoted specimens in good condition.

All the mimics have white spots in fore-wing and yellowish patch in hind except the males of the *fallax* form of *A. johnstoni*, Godm., which have yellowish spots in fore-wing. [The *fallax* are very interesting in that they resemble the two specimens captured by Mr. and Mrs. S. L. Hinde, one at Fort Hall and the other above the Goura River, and described as trending in the direction of *johnstoni* in Trans. Ent. Soc. Lond., 1906, p. 309. E. B. P.]

These captures compare in an interesting manner with those made by C. A. Wiggins, near the N.E. shores of the Victoria Nyanza, and described by Mr. S. A. Neave, M.A., B.Sc., F.E.S., in Trans. Ent. Soc. Lond., 1906, pp. 213, 214.

(b) *Nairobi*.

1906, Aug. 30. *P. echerioides*, Trim., 1 ♂.

1907, Feb. 2. *Acræa johnstoni*, Godm., f. *semifulvescens*, Oberth., 1 ♂ slightly worn.

Feb. 4. *P. echerioides*, 3 ♂, 2 slightly worn; the third represented in Plate XXVIII, fig. 5.

P. echerioides, 1 ♀, worn, and right hind-wing notched.

P. jacksoni, E. M. Sharpe, 1 ♂. Represented in Plate XXVIII, fig. 3.

P. dardanus, probably sub-sp. *tibullus*, 1 ♂. Represented in Plate XXVIII, fig. 7.

P. dardanus, probably sub-sp. *tibullus*, 1 ♀ of the *ecnea*, Stoll., form, somewhat transitional towards the *hippocoön* ♀ f., worn and much chipped, apparently by birds. Represented in Plate XXVIII, fig. 6.

Acræa johnstoni, form *flavescens*, Oberth., 1 ♂, worn.

On this last-named day many other males of both *P. echerioides* and *P. dardanus* were seen and several females of the *hippocoön* form of the latter. It is interesting to note that although the model was not taken, no less than three species of *Papilio* possessing *echeria-albimaculata*-like females were captured on Feb. 4.

(c) *Kijabe*.

1906, Aug. 3. *Amauris albimaculata*, Butl., 1 ♂. Represented in Plate XXVIII, fig. 1.

Papilio jacksoni, 6 ♂, 3 ♀.

1 ♂ with right hind-wing with anal half shorn off; rather worn.

1 ♂ and 1 ♀, each with chip in left hind-wing, the ♂ a little worn, the ♀ fresh.

Of the rest, 2 ♂ and 2 ♀, a little worn; the most perfect ♀ is represented in Plate XXVIII, fig. 2.

Aug. 6. *P. jacksoni*, 2 ♂ and 2 ♀. Both females worn, one slightly.

1907, Feb. 6. *P. jacksoni*, 1 ♂ and 2 ♀. Both females worn, one slightly, and both chipped near anal angle of hind-wing.

(d) *Mogoiri* and *Tuso*.

1907, April 29. *Amauris albimaculata*, 2 ♀, rather worn.

March 1. *A. albimaculata*, 1 ♀, much worn.

Neptis woodwardi, E. M. Sharpe, 1 ♂, worn, hind-wing patch white.

March 2. *N. woodwardi*, 2 ♂, one a little worn.

1. *The Primary Danaine Models.*

In Kikuyu *Amauris albimaculata*, Butl., is the dominant species and all my specimens belong to it, whereas on Kili-manjaro *Amauris echeria*, Stoll., is also commonly found, as is usually the case where *A. albimaculata* occurs. It is quite probable that *A. echeria* exists in Kikuyu, but it must have been comparatively rare in the under-mentioned localities at the times when I visited them.

2. *Nymphaline Mimics.*

I have never met with *Euralia mima*, Trim.;* and the British East African forms of *Pseudacraea lucretia* seem to fall more properly into the group of which *A. ochlea* is the centre. Certain varieties of the female in the closely allied sub-species *tarquinia* from Natal are, on the other hand, excellent mimics of *Amauris echeria* and *albimaculata*.

A form of the female *Aterica galene* appears to be a well-marked member of this group, while the male is a more outlying member. Although probably always mimetic this species is very independent of the local

* When glancing over the splendid collection of Congo butterflies in the Brussels Museum, under the kind direction of Monsieur Severin, I noticed several *echeria*-like specimens of *Euralia dinarcha*, Hew.—the var. *bartteloti*—Grose-Smith, from Beni Bendi, in the central part of the State. I was astonished at this because it was fairly certain that the well-known models did not exist in that locality. Turning to the *Danainæ*, it was at once evident that a form of *Amauris egialea*, Cram., with an ochreous hind-wing patch, occurred at the same locality and supplied the model. E. B. P.

presence of its models, and the specimens of this particular form of the female with a brown patch on the hind-wing were taken in the coast localities from which the Danaine model is in my experience absent, although it is common near Voi, 100 miles inland. These captures of *galene* in the coast localities were as follows:—Kaya Kauma (Aug. 21, 1903), Rabai (May 10, 1906), Jilore (July 16, 1906), Ndzovuni (July 21 and Oct. 5, 1906).

[Address and date lost.

Aterica galene bears some superficial resemblance in colour to *Amauris albimaculata*, but its habits are quite different. Like all this group it is fond of sitting on the ground in paths of woods where there is much light and shade. If disturbed it merely flies a little way and settles again.

Acræa johnstoni and *Neptis woodwardi* bear somewhat the same relation to this group as *Planema aganice* and its *Pseudacræa* mimic bear to the black white and *A. niavius dominicanus* group, viz. the relation of a pair of secondarily associated butterflies which are also members of a large combination surrounding a primary Danaine model. Both *Acræa* and *Neptis* resemble each other in habits, and on the wing it is difficult to distinguish them. Their appearance is, generally speaking, not dissimilar from that of the primary model in spite of its much greater size.]

[Rabai, Sept. 30, 1906.

Of those new to me [in Kikuyu] the most interesting was a species of *Neptis* [*N. woodwardi*] which seems to have been modified so as to resemble *Acræa johnstoni*, though the resemblance is not very close.]

Professor Poulton has added to this account of the Nymphaline mimics of the *Amauris echeria*-and-*albimaculata*-centred combination a comparison of the specimens of *Neptis woodwardi* captured far to the W. of the Rift Valley with those taken by me just E. of it.

(a) *Specimens of Neptis woodwardi from the E. of the Rift Valley compared with those from the W.* E. B. P.

It is very interesting to compare the 8 specimens of *Neptis woodwardi*, E. M. Sharpe, obtained by Mr. St. Aubyn Rogers on the eastern heights overlooking the Rift Valley, with the equal number captured by Mr. C. A. Wiggins

(Plate XXIX, fig. 4), however, in which the bar is much wider and the white spots in the fore-wing much larger, are distinct members of the combination, with a strong secondary approach towards the *proteina*, Oberth., form of *Acræa johnstoni*. The E. males (Plate XXIX, fig. 1) resemble these two W. females in both size of spots and breadth of the ochreous bar, so that they too are well-marked members of the association. The single E. female (from Weithaga) is developed still further in the same direction (Plate XXIX, fig. 2), being as far in advance of the E. females as these are beyond their own males.

It is probable that *Neptis woodwardi* has been developed from a form resembling *N. incongrua*. As regards the reduction of the spots in the fore-wing and the loss of the fifth spot the W. males are more specialised than the E. As regards the development of an ochreous patch out of a narrow band the E. males and especially the female are the more specialised. In *N. incongrua* the numerous white spots form an irregular bar across the fore-wing. By the loss of certain spots the bar-like appearance disappears in *N. woodwardi*, while just those elements are retained which bring about the mimetic resemblance to *Acræa johnstoni*. In the same manner the narrow white bar crossing the hind-wing of *incongrua* is withdrawn towards the base, broadened, and transformed into ochreous in *woodwardi*,—all of which changes are in the directions of the Acraeine secondary and Danaïne primary models. The hind-wing bar of *woodwardi* from both E. and W. of the Rift Valley occasionally retains more or less of the white ground of *incongrua*. In such examples the costal end of the bar is generally tinged with ochreous. E. B. P.

3. *Acraeine Mimics.*

The resemblance of the *proteina*, *flavescens*, and *fallax* (= *kilimandjara*, Oberth.) forms of *A. johnstoni* to the *echeria-albimaculata* models was described and figured by Professor Poulton in 1906,* together with the likeness of the forms *fulvescens*, Oberth., and *semifulvescens*, to very different Danaïne and Acraeine models. The mimicry of *Amauris echeria* by the commonest forms of *A. johnstoni*, viz. *proteina* and *flavescens*, had been suggested by the same naturalist as early as 1897.† His 1906 memoir

* Trans. Ent. Soc. Lond., 1906, pp. 299-311, Plates XXI, XXII.

† Report British Association, Toronto, 1897, pp. 688-691.

above referred to, dealt with the material obtained by me in Taveta and from the slopes of Kilimanjaro, but no complete list of specimens is given in it. Later captures have so far increased the series of this protean species as to make it worth while to publish the whole list from these localities and from Dabida Hill in the Taita district. It will be thus possible to gain some idea of the relative abundance of the various widely separated forms.

(a) *Tabular statement of the forms of *Acraea johnstoni* captured at Taita, Taveta, and Kilimanjaro, May 1904-Jan. 1906.*

LOCALITY AND DATE.	Forms of <i>Acraea johnstoni</i> , Godm. (including <i>fallax</i> , the eastern representative of <i>A. lycoa</i> , Godt.).					
	<i>protina</i> .	<i>fallax</i> ♀.	<i>fallax</i> ♂.	<i>flaves-cens</i> .	<i>semi-fulvescens</i> .	<i>fulvescens</i> .
TAITA, DABIDA. 1904.						
May 25 . . .	...	...	...	1 ♂ W	...	...
May 26 . . .	1 ♀ W	...	...	...	...	...
May 30 . . .	...	...	...	1 ♂	...	1 ♂
May 31 . . .	1 ♂ W -	...	...	...	...	...
June 8 . . .	1 ♂	...	...	...	...	...
TAVETA. 1905.						
April 21 . . .	1 ♀	...	...	1 ♂	...	...
May 15 . . .	...	...	...	...	1 ♀ F ₁	...
KILIMANJARO.						
May . . .	1 ♂ W	...	...	...	...	1 ♀ W +
KILIMANJARO, MAMBA STATE, about 5000 ft.						
Sept. 15 . . .	...	...	1 ♂ W -	...	...	...
Sept. 21 . . .	...	...	1 ♂	...	...	...
Sept. 26 . . .	1 ♂ W	...	1 ♂ W	...	1 ♂ F ₂	...
KILIMANJARO.						
Dec. 15-31 . . .	...	2 ♀ 1 W 1 F ₃	1 ♂ F ₄	3 ♂ 2 W 1 F ₅	1 ♂ W	1 ♂ F ₆
1906.						
Jan. 5-16 . . .	2 ♂ W *	...	2 ♂ W -	...	2 ♂ W	3 ♂ 1 W 1 W -
Totals . . .	6 ♂ ; 2 ♀	2 ♀	6 ♂	6 ♂	4 ♂ ; 1 ♀	5 ♂ ; 1 ♀

* One captured Jan. 26-31, 1906.

The following specimens are figured by Professor Poulton in *Trans. Ent. Soc. Lond.*, 1906, p. 281.

F 1	figured in <i>Trans. Ent. Soc. Lond.</i> , 1906:	Plate XXII,	Fig. 2 ^a .
F 2	"	"	Plate XXI, Fig. 3 ^a .
F 3	"	"	" Fig. 2 ^a .
F 4	"	"	" Fig. 1 ^a .
F 5	"	"	" Fig. 1 ^b .
F 6	"	"	" Fig. 4 ^a .

The tabulated examples of *flavescens* possessed very pale ochreous spots in the fore-wing, so that it was difficult to distinguish worn specimens from *proteina* with its white spots. Omitting the consideration of *fallax*, which may be a distinct species, it is seen by this list that *semifulvescens* is by no means rare as compared with the other two forms.

[So far as this comparatively short list enables us to judge, *fulvescens* is nearly half as numerous and *semifulvescens* about a third as numerous as the combined *proteina* and *flavescens* forms. This means that they are far from rare, and helps us to understand the probable secondary mimicry of *fulvescens* by the under side of the female *Acræa uvui*, Grose-Smith. A single specimen of the female of this small *Acræa* was captured in Mamba, Kilimanjaro, on September 25, 1905. The under side of the specimen differs entirely from that of the extremely abundant male and from other females of its group, in the overspreading fulvous tint which tends to obliterate the markings, producing at the same time a considerable superficial resemblance to the *fulvescens* form of *A. johnstoni*.

The *fulvescens* form, in addition to its mimicry of the *dorippus*, Klug, form of *Danaida chrysippus*, L., resembles the *daira* form of *Acræa encedon*, L. Both *dorippus* and *daira*, Godm. and Salv., are the dominant forms of their respective species. The local form of *Acræa doubledayi*, Guér., of which a male was taken on Kilimanjaro, January 26-31, 1906, also much resembles *daira* and *fulvescens*, and would probably be indistinguishable from these when upon the wing. E. B. P.]

[Address and date lost.

The two different forms of this [*Acræa johnstoni*] resemble other protected species, the commoner forms [*proteina* and *flavescens*] being very like *A. albimaculata* which

is common on the Taita hills: the other form [*fulvescens*] I thought to be a different species until I perceived that the white spots on the fore-wing were traceable though almost obsolete. It is very difficult to distinguish it from *Acræa encedon* on the wing, but it is I think both brighter and lighter in colour. It is more active than most *Acræas*, but shares with these their remarkable resistance to Potassium cyanide in the killing bottle.]

[Mombasa, April 5, 1905.]

A. johnstoni I have only found on the hills at 3000 ft. upwards. I did not get it at Taveta, or indeed *A. albimaculata*, which also seems a hill insect.]

[It will be seen by reference to the table on p. 515 that soon after the above letter was written, forms of *A. johnstoni* were taken at Taveta. E. B. P.]

4. *Papilionine Mimics*. The mimetic females of the three species of *Papilio* are well shown, two-thirds of the natural size, on Plate XXVIII, together with their non-mimetic males and chief Danaine model. It is seen that the females of *Papilio jacksoni* (Fig. 2) and especially of *P. echerioides* (Fig. 4) are more perfect mimics of the *Amauris* (Fig. 1) than the *cenæa* female form (Fig. 6) of *P. dardanus* (*merope*), probably sub-species *tibullus*. The latter happens to be a very imperfect specimen of a variety tending towards the *hippocoon* female form and rather a poor mimic. The series of specimens represented in Plate XXIV of this year's Transactions (1907) shows that the mimicry of the *cenæa* form is usually better than in the example here figured. I have already alluded to the fact that all three *Papilio* mimics were taken at Nairobi on the same day (see Figs. 3, 5, 6 and 7 on Plate XXVIII), though one species (*P. jacksoni*) was represented by the male only which is not mimetic of *Amauris*. Another point of interest is the local preponderance of *Papilio jacksoni* where it is found. This preponderance at Kijabi is, I think, fairly represented by the series obtained there, and suggests that the *Papilio* may itself be distasteful to certain enemies, but gains advantage in the adoption by its female of a well-known Danaine pattern. Although a mimic, the *Papilio* may in its own habitat far outnumber the model, which however has a much greater range and is of course as a whole an infinitely more abundant insect.

In nature the *Papilio echerioides* female is much nearer

to the primary model than the other female *Papilio*s, and, were it not for the characteristic habit of hovering nervously over a flower, it would be very difficult to distinguish it from the *Amauris*. This close resemblance is especially remarkable when it is remembered that the under surface is mimetic of a very different model—*Planema aganice*.

I have never met with the *cenea* form of the ♀ of *P. dardanus* sub-species *tibullus* at all frequently, although I have taken it at Taveta, e. g. on August 4, 1905. Furthermore, three specimens were brought me from Kilimanjaro, where it is probably common. Two of these are distinguished by the yellow colour of the disc of the hind-wing and some of the fore-wing spots, suggesting affinity with the primitive *trimeni*-like *cenea* female forms of *Papilio polytrophus* from the Kikuyu escarpment.

I have also received males of *Papilio echerioides* from the same locality and have taken them at Taveta and in Taita.

[Mombasa, April 5, 1905.]

On Dabida [Taita] I have only taken *Papilio echerioides* above 3000 ft.]

It would be of great interest to obtain the female from these localities, but there can be no doubt that it is the same form as that captured in the Kikuyu country. Dr. Karl Jordan, who has seen the specimens, informs me that they are not quite the same as typical *echerioides* from Natal, Gazaland, etc., but are transitional between this and the Abyssinian sub-species, *oscaris*, Rothsch. and Jord.

5. *Moth Mimics*.—*Aletis monteironis*, Druce, is an abundant species in North Kikuyu and, owing to its slow flight, a most conspicuous insect. It frequents more open country than the *Amauris*, but they may often be seen flying together. The resemblance is not strong on the wing, as the large pale areas of the moth are very prominent, and it is probable that it is itself a protected species, and has been but little modified by its association with the Danaine model.

(a) *Further Notes on Moth Mimics*. E. B. P.

The day-flying moth, *Aletis monteironis*, Druce, which looks so entirely different from the *Amauris* in the cabinet, is, Mr. Marshall informs me, quite a good mimic

of *Amauris lobengula*, E. M. Sharpe, when upon the wing. It occurs plentifully in British East Africa in localities where *Amauris echeria* and *albimaculata* are dominant. Thus I have received many from the neighbourhood of Fort Hall captured by my kind friends Mr. and Mrs. S. L. Hinde. Colonel Manders, who captured it with one of the *Amauris* models at Delagoa Bay, informs me that he thought it a good mimic on the wing, but when the set species were compared the very different patterns led him to conclude that he had made a mistake. The whole Geometrid genus *Aletis* is undoubtedly highly distasteful. Its ordinary pattern, e. g., that of *A. helcita*, Linn., of the West Coast and *A. libyssa*, Hopff., of the East, is probably the centre of an important combination (see p. 522) associated with that which surrounds *Danaida chrysippus*, but possessing strongly-marked independent aposematic elements of its own. In spite of these latter, the association with *chrysippus* has always been looked upon as synaposematic—a conclusion now strongly confirmed by this undoubted resemblance upon the wing of another species of *Aletis* to another Danaïne model.

Aletis monteironis only differs from *A. libyssa* in the tint of the ground colour, a peculiar ochraceous in the former, a brilliant fulvous in the latter. *A. monteironis* is probably a form of *A. libyssa* which has undergone a change in the tint of the ground colour in areas where the *echeria* (or *lobengula*) and *albimaculata* models are dominant. In spite of the special resemblance to *A. lobengula* observed by Mr. Marshall the distribution of the moth clearly indicates association with both the other allied forms of *Amauris*, viz. *echeria* and *albimaculata*. E. B. P.

III. *Danaida (Limnas) chrysippus*-centred Combination in British East Africa.

1. *The Primary Danaïne model.* In East Africa generally the form *dorippus*, Klug (*klugii*, Butl.), is far more common than the type form, probably in the proportion of ten to one.

D. chrysippus seems very subject to the attacks of Dipterous parasites. Out of 10 pupæ which I bred from larvæ at Weithaga no less than 9 were destroyed by the larvæ of a fly, which has been identified by Mr. E. E. Austen as belonging to the genus *Blepharipoda*, of the *Tachinidæ*. These emerged on various dates in April,

1907. Thus my experience in British East Africa confirms that of Mr. G. A. K. Marshall in Rhodesia* and of Colonel J. W. Yerbury at Aden,† and supplies further evidence in refutation of Erich Haase's‡ assumption that the immunity of specially protected forms is absolute and defends them from the attacks of parasitic foes as well as vertebrate enemies.

[Taveta, July 5, 1905.]

D. chrysippus, for several months past, as far as I have seen, has been always of the *klugii* form, and I have not seen 6 specimens of the type form in 6 months.]

[Rabai, May 1, 1906.]

Have you any reason to believe that the *klugii* form is spreading at the expense of the type form of *D. chrysippus*? It would certainly seem to be the case in this Protectorate. The great rarity of the type form which I noticed before is by no means confined to Taveta, but seems universal on the Coast district, where the climatic conditions are anything but those of a desert area. I doubt if I have seen half-a-dozen of the type form in the last 2½ months, whereas the *klugii* form has been as common as usual.]

2. *Nymphaline Mimics.* *Hypolimnna misippus*, Linn., also abounds in British East Africa, but unlike the Danaine model, the proportionate number of the two females (*inaria*, Cr., and the type form) shows no marked preponderance on either side.

There are also two species of *Euryphene*—*E. senegalensis*, Herr.-Sch., and *E. chriemhilda*, Staud., both occurring in the Coast hills, the females of which seem at first sight to come into the *chrysippus*-centred association. Both species frequent shady places and are generally common where found. Both male and female of both species settle on the ground and on plants with their wings spread out. They differ somewhat in their preferences, *E. senegalensis* being generally found in cultivated country—banana plantations and such like—whilst *E. chriemhilda* affects the real forest country and is more local. In both species the female greatly resembles *L. chrysippus*, but on the upper side

* Trans. Ent. Soc. Lond., 1902, p. 338.

† Journ. Bomb. Nat. Hist. Soc., 1892, p. 209.

‡ Researches on Mimicry, Part II, English Translation, Stuttgart, 1896.

only; while the male, which is destitute of the black and white tip, cannot be said to mimic this Danaine. The habits of both *Euryphenes* are however markedly different from those of the other members of this combination. All these latter have a leisurely floating flight which increases the resemblance to the model. The *Euryphenes*, on the other hand, are characterised by a rapid skimming flight close to the ground, on which they are very fond of settling with their wings expanded. In such a position they are really very inconspicuous in the intense light and shade of the woodland and forest habitat which they prefer. They have moreover an under side which is evidently procryptic, and when sitting with closed wings they are exceedingly difficult to detect even when one has actually seen them come to rest. However, it is just possible that they may obtain some advantage from adopting a well-known aposematic appearance, and it is certainly difficult to account for the pattern of the female in any other way.

[Mombasa, Jan. 31, 1905.]

I must say I have doubts about the species of *Euryphene* which resemble *L. chrysippus* being mimics at all. There are two species of this group in the Rabai district, of which one is common and widely distributed in the district [*E. senegalensis*], whilst the other seems much more local [*E. chricmhilda*]. Both of these have [in the female] the colouring of the type form of *L. chrysippus*, but their habits are totally different. They are woodland insects, and have a rapid skimming flight about a foot from the ground, on which they are very fond of settling, though they also settle not unfrequently on low bushes. They almost invariably settle with their wings expanded, and frequently remain in this position for a considerable time. In fact, their habits and haunts are so totally different from those of *D. chrysippus* as to make it exceedingly unlikely that they are in any true sense mimics at all.]

3. *Acræine Mimics*. *Acræa encedon*, L., is quite common everywhere, and the form *daira*, mimicking *dorippus*, is certainly considerably more abundant than the typical *encedon*. The *fulvescens* form of *Acræa johnstoni* with other convergent *Acræas* belonging to the *dorippus*-centred combination has been already considered on pp. 514-517.

4. *Papilionine Mimics*. *Papilio dardanus*, sub-sp. *tibullus*,

♀ form *trophonius*, Westw. This form of the female is far less common than the *hippocoön* form, but it does occur at Rabai, etc., and, as is well known, bears a remarkable resemblance to the Danaine model. Its flight is stronger and generally more lofty, so that it can be recognised on the wing, but in all other respects it is a very good mimic. A new form of the female from Nairobi is described by Mr. Roland Trimen in the Appendix (p. 554) under the name *dorippoides*. As its name implies it is a mimic of the *dorippus* form.

5. *Moth Mimics*. The Geometrid (*Boarminea*) moth *Parapterychodes tenuis* should probably be associated with *D. chrysippus*, to which in general pattern it bears much resemblance. The moth is however, like the Euryphenes, a forest insect. I have taken it at Ndzovuni, near Rabai (July 21, 1906).

IV. *The Aletis-Euphædra Combination in British East Africa.*

I have not as yet encountered many of the members of this powerful association so closely related to the *chrysippus*-centred combination and yet distinguished by distinct and conspicuous characters of its own. The probable central model in British East Africa is distinguished in the British Museum, as *Aletis ethelinda*, Kirby, from the well-known south-eastern species *A. libyssa*, Hopff. The only apparent difference is the deeper richer tint of the fulvous ground colour in the examples of the more northern form in the National Collection. My own specimens however taken at Rabai (a male on Oct. 13, a female on Oct. 30, 1906) do not differ in this respect from the southern *Aletis libyssa*; and it is exceedingly doubtful whether *A. ethelinda* can be maintained as a separate species.

The only other member of the combination I have seen is *Euphædra eleus*, Drury, which I have once taken at Rabai in forest country.

B. ACRÆA-CENTRED MIMETIC COMBINATIONS.

These associations differ from those with Danaine models, because of the dominant place taken by synaposematic Acraeas themselves, and consequently the smaller proportion of mimics belonging to other groups.

a. *A Planema-Acræa-centred Combination.*

Both at Taveta and Rabai the form of *Planema aganice*, Hew., which has been named by Dr. Butler *Planema montana*, is common. This form is characterised by the rich fulvous colouring of the male, the female coming into the black and white combination centred round *Amauris niavius* f. *dominicanus*, as referred to on pp. 507, 508. Associated with this species, but perhaps always less numerous, I took a form of *Acræa esebria*, Hew., called by Miss Sharpe *Acræa jacksoni*, which bears a strong resemblance to it, especially on the wing, where the details of the black and fulvous colouring would not be prominent. This form is considerably smaller than *Planema aganice*, but they are so much alike that it was some time before I realised that they were not the same species.

[Rabai, July 1, 1908.

I once took a *Pseudathyma* (possibly a new species), now in the British Museum, which quite deceived me on the wing. I took it for *A. esebria* until I had it in the net.]

[Plymouth, Jan. 2, 1908.

I may also refer to the obvious resemblance of a male *Pseudacræa** to the males of these two *Acræines* [especially the rich fulvous-marked *Planema montana*], although I have not myself taken this mimic. The single specimen (from Shimba) in the collection I sent to Oxford, was given to me. This *Pseudacræa* from Shimba is probably the male of the form allied to *P. hircæ*, mentioned on p. 508.]

1. *Further notes on Planema-Acræa Combinations.*

E. B. P.

My kind friend the author has presented to the Hope Department the following specimens of *Planema aganice* f. *montana* together with the *Acræas* resembling it:—

Dabida (May 25—June 16, 1904): 2 ♂ and 3 ♀ of *montana*, all normal except one female with a pale ochreous instead of a white patch on the hind-wing. There are no specimens of *A. esebria* from this locality.

* *Pseudacræa rogersi*, sp. nov. See Appendix, p. 549.

Taveta (May 8, 1905—Jan. 30, 1906): 7 ♂ and 4 ♀ of *montana*, 2 of the females with the pale markings of a cream tint instead of white: 6 *A. esebria*, of which 2 resemble the males of *montana* and possess fulvous markings, the others pale ochreous.

Kilimanjaro (Jan. 26–31, 1906): 1 ♀ *montana*: 1 ♀ *Acræa carmentis*. The latter is white-marked and resembles the much larger female of *montana*.

In looking through the fine collection of butterflies from the Congo State in the Brussels Museum I was surprised to find that the form *montana* was abundantly represented from this area.

In Mr. St. Aubyn Rogers' experience *Acræa esebria* is less abundant than the *Planema*, and the above figures support this conclusion. In Southern Africa, on the other hand, the *Acræa* appears to be much commoner than *P. aganice*. There is however a similar mimetic relationship,—and the same is true of the representative forms of *Acræa* and *Planema* on the West Coast. Everywhere the *Acræa* seems to exist with the *Planema* and to act as a variable and unstable mimic. The far greater constancy of the colours of the *Planema* leads to the inference that it is the model and the *Acræa* the mimic. Varieties of the latter commonly diverge and become rough but undoubted mimics of *Danaïda chrysippus*. There can be no doubt that the usual strong superficial resemblance between these two *Acræinæ*, combined with the divergence of *esebria* from the ordinary colouring and pattern of the genus *Acræa*, led to its erroneous inclusion for a time in *Planema*.

It is interesting to attempt to answer the question why *Planema aganice* acts as the model although it is, probably for the most part, a less abundant species. The reason is probably to be found in its greater constancy and also in its larger size. There are several other instances of mimetic associations between *Planema* and *Acræa*: in all that I am acquainted with the *Planema* is the larger insect and appears to act as the model. The dominance of a butterfly in the environment is affected by size as well as by numbers and other qualities: *cæteris paribus*, a large butterfly is likely to act as model for a small one. In a parallel instance from tropical America, the larger Nymphaline, *Colænis julia*, Fab., appears to act as model for the smaller Heliconine, *Euclides aliphera*, Godt., both

species swarming together over an immense range, and both probably equally distasteful. Evidence that *Colænis* is the model is yielded by a comparison of the northern and southern forms of both species. The northern *Eucides*, although diverging from the southern in the same manner as the *Colænis*, has not changed to so great a degree. In other words, the *Colænis* leads and the *Eucides* follows.

It is interesting to note that greater conspicuousness due to size may act in the same manner as greater conspicuousness due to pattern. *Amauris dominicanus* as contrasted with *A. echeria*, etc., seems to be an example of dominance due in large part to pattern. (See p. 432.)

These causes of predominant influence are of course relatively rare, the usual causes being greater unpalatability and superior numbers. Thus in nearly all the examples of mimicry figured in the four plates accompanying this memoir, the mimics are larger than their models, but the latter belong to the highly protected *Danainæ* and the genus *Mylothris*. The mimicry of the larger red and black *Acræas* by the immense *Papilio antimachus*, Dru., is a grand example of models far smaller than their mimic. There can be no doubt however that the models are here enormously more abundant and probably more distasteful than their gigantic mimic. In the case of *Planema-Acræa* and of *Colænis-Eucides* discussed above, there is not the same evidence for discriminating widely between the palatability and the relative abundance of the members of each pair. Their difference in size remains as an important distinction, and in both cases there is evidence that the larger species has acted as the model.

E. B. P.

b. *Red-and-black Combination centred by large Acræas.*

The commonest species in this group is *Acræa natalica*, Boisd., which is often very abundant, e.g. at Taveta. There are however several other *Acræas* which come into this group, though the distribution of the black spots on the red ground varies a good deal. These include *A. acara*, Hew., *A. anemosa*, Hew., *A. areca*, Mab., and *A. pharsalus*, Ward. Together with these must be associated the larger Nymphaline butterfly *Pseudacræa trimenii*, Butl., which is connected with the other species as regards pattern by *A. acara*, as regards size by *A. areca*.

Now although I have usually found *P. trimenii* a rare species, this is not the case at Rabai. In fact, in some seasons it is more common than any other member of the group with the single exception of *A. natalica*. It frequents much the same situations as the *Acræas* but its flight is more lofty and sustained, and when alarmed it goes off at a great rate. Still the integuments of the thorax are very tough and quite different from those of species which adopt a protective (cryptic) appearance. Although the specimens of *trimenii* from British East Africa differ in some details from the South African type, still they always have the brilliant pink and pearly white under side which at once distinguishes them from the nearly allied *P. boisduvali*, Doubl., in which the corresponding surface is ochreous.

[*Taveta*, July 5, 1905.]

Abantis tettensis, Hopff., mimicking on the under surface and at rest the pattern of the smallest *Acræas* of the *doubledayi* type, was quite common here in the rains in one place. It flies backwards and forwards with great rapidity quite in the usual skipper manner, and always settles with wings half-raised, so that it gives no idea of an *Acræa* on the wing or during the brief pauses between successive flights.]

1. *Further notes on Combination centred by large red-and-black Acræas.* E. B. P.

This group of large *Acræas* also includes *Acræa chilo*, Godm., captured by Rev. St. Aubyn Rogers in several localities. *A. astrigera*, Butl., not in his collection, but sent to me by Mr. and Mrs. S. L. Hinde from Fort Hall and Kitui, must also be regarded as a member, although apparently much rarer than any of the others. The group is furthermore perhaps united by its smallest members, *A. pharsalus* and small individuals of *A. natalica*, with the still smaller species,—*acrita*, Hewits., *bræxia*, Godm., *doubledayi*, Guér., and *neobule*, Doubl. The following table shows the numbers of specimens (with the inclusive dates) at Oxford captured by Mr. St. Aubyn Rogers at various localities in British East Africa.

LOCALITIES.	DATES.												
		<i>Acræa acerita</i> .	<i>Acræa bresia</i> .	<i>Acræa neobule</i> .	<i>Acræa doubleclayi</i> .	<i>Acræa natalica</i> .	<i>Acræa pharxalus</i> .	<i>Acræa arcea</i> .	<i>Acræa anemosa</i> .	<i>Acræa chilo</i> .	<i>Acræa acara</i> .	<i>Pseudacræa trimenii</i> .	
The Coast district.	Menbasa	May 16—June 25, 1904.	...	...	...	...	...	1	...	...	1	...
	Rabai	April 1, 1905.	...	...	...	...	...	2	...	...	...	...
		May 28—Oct. 14, 1903.	...	...	...	1	1	...	2	1	...	1
		March 24, 1906—Jan. 21, 1907.	7	5	7	8
	Kalolein, Kaya Kauma, and Kowini	Feb. 21, 1903—Jan. 13, 1904.	...	5	1	6
		March 12, 13, 1906.	1	1	...
	Jilore, Mangepa, Ndzovuni, and Mleji (Giryama)	July 16—24, 1906.	1	...	4	1	...	2	2
	Mwaeba Hill and Shimba	Nov. 25, 1904.	1	...
		Oct. 4—Dec., 1905.	2	1	...
	Mazeras (Uganda Railway)	May 19, 1906.	1
Mackinnon Road (Uganda Railway) and Maketao	April 10—June 13, 1905.	...	1	...	...	...	...	...	...	2	...	...
Voi to Taveta	April, 1905.	...	6	...	...	...	...	...	...	1	...	...
Taita Plain, Dabida and Sagalla Mountains	May 25—Jun. 21, 1904.	4	1	...	...	1	1	2	...	2	3	...
Taita	May 25, 1905.	1	...	...	...	...	...	...	...	...	...	...
Taveta	April 13, 1905—Jan. 26, 1906.	3	16	8	1	19	...	...	1	...	1	1
Kilimanjaro	May, 1905—Jan. 31, 1906.	1	1	...	1	...	1	4	...	...	...	...
Totals . . . . .	...	9	30	5	11	25	2	18	6	11	18	11

When the author was in England I asked him if he would kindly give me his general impressions of the relative abundance of the chief members of this important combination. At Rabai, *A. natalica* was the commonest, and then the following species arranged in the order of their abundance:—*Pseudacræa trimenii*, *Acræa acara*, *A. anemosa*, *A. arcea*. At Taveta, on the other hand, where *natalica* swarms, the *Pseudacræa* was the rarest, and no definite impression remained of the relative numbers of the others. In the neighbourhood of Taita, *natalica* was the commonest species, and *arcea* next, while the *Pseudacræa* was not seen.

It is important to bear in mind these impressions, founded on an experience going back to 1898, when studying the table printed above.

The relation of the eastern and western sub-species of *Pseudacræa boisduvali* to their respective *Acræine* models is interesting and peculiar. There can be no doubt that the eastern sub-species *trimenii* with its conspicuous sub-apical yellow-ochreous fore-wing bar, mimics *Acræa acara* (in which the apical portion of the fore-wing is warm reddish-ochre), and bears no very close resemblance to *areca* or to any of the other large red black-marked eastern *Acræas*. The western *boisduvali*, on the other hand, is a much closer mimic of *Acræa egina*, the western representative of *areca*, than it is of *zetes*, the representative of the eastern model of *trimenii*. This is all the more remarkable because *zetes* is replaced by *acara* in the Cameroons, as I was astonished to find in the collection of the Brussels Museum.

This mimetic relationship is unusual, and is all the more remarkable because the eastern mimic is transitional into the western, the eastern model into the western *zetes*, the western model into the eastern *egina*. It is probable that this curious relationship is to be explained by the fact that *acara* is, on the whole, predominant over *areca* in the range of *trimenii*, and *egina* (the W. representative of *areca*) predominant over *zetes* (the W. representative of *acara*) in the range of *boisduvali*. (Compare Mr. Roland Trimen's account on pp. 552-554.*)

A very interesting detail in the mimetic resemblance of the *Pseudacræa* is to be seen in the palpi, which are orange like those of *Acræa acara*, *A. areca*, *A. anemosa*, and *A. natalica*. A parallel case is to be found in the *Methona-Thyridia*-centred combination of tropical South America, in which the yellow or orange-clubbed antennæ of the models are mimicked by *Danaïna* (*Ituna*), *Pierina* (*Dismorphia*) and Castniid moths. In both cases the small size of the mimetic feature is probably compensated by its prominence.

E. B. P.

c. *Combination of small fulvous and black Acræas from Weithaga.*

This group consists entirely of species of the genus

* Just as Mr. Trimen finds obvious links with the western *boisduvali* in the pattern of certain eastern individuals, and especially one of the Rabai specimens here referred to, so also a clear transition towards the eastern *trimenii* may be seen in Angolan specimens in which a trace of the ochreous sub-apical fore-wing bar is present. It is however probable that *acara* and not *zetes* is the Angolan form.

Acræa, i. e. *A. cabira*, Hopff.; *A. vinidia*, Hew.; *A. alicia*, E. M. Sharpe, and *A. terpsichore*, L. (*serena*, Fabr.), the latter being an outlying member.

In Northern Kikuyu it is the local species *A. alicia*, which is dominant in numbers. This species is by far the most abundant butterfly in the whole country, and I once counted 460 specimens which had settled for the night on one small tree. *A. alicia* flits restlessly round bushes and small trees, quite after the manner of some of the blues. They settle occasionally on the trees or on low herbage. The males are much the commoner. Although so different on the under side, I could not distinguish the males and females on the wing. The female of *A. alicia* is dimorphic on the under side, and the two forms bear a considerable resemblance on this surface to *A. cabira*, Hopff., and *A. vinidia*, Hew. (f. *tenella*, Rogenh.) respectively.

The captures of members of this group are recorded in the table prepared by Professor Poulton, on p. 530.

1. *Description of two mimetic forms of the female of Acræa alicia*, E. M. Sharpe. E. B. P.

Acræa alicia, E. M. Sharpe, new female form, *cabiroides*.

The distinguishing features of this form are confined to the under surface, which is alone referred to in the following account. The under surface of the hind-wing and of the apical region of the fore-, bears a strong superficial likeness to the same parts of the larger butterfly, *Acræa cabira*, Hopff. The broad bar crossing the centre of the hind-wing and to a less extent the sub-apical bar of the fore-wing tend to become very pale, often attaining a cream tint like that of the same markings in *cabira*. The wide and complex marginal markings much resemble those of *cabira*, the internal contour of the marginal band is a pronounced bay near the apical angle of the hind-wing, being strikingly similar. The sub-basal band of black spots of the hind-wing is strongly developed and often presents the appearance of an irregular double row, although the dark red colour which is conspicuous between the two rows of *cabira* is almost wanting. Within these spots the base of the hind-wing is of a greyish tint, as in *cabira*.

The features which distinguish *cabiroides* are thus con-

WEITHAOA.	<i>Acræa terpsichore</i> (<i>serena</i>).	<i>Acræa cabira</i> .	<i>Acræa vinidia</i> .	<i>Acræa alicia</i> .
1906.				
Aug. 9 . .	...	...	...	3 ♂ 2 W } 3 ♀ <i>c.</i> 2 ♀ <i>t.</i> } all W 1 ♀ <i>i.</i> }
Aug. 11 . .	...	...	...	1 ♀ <i>c.</i> W -
Aug. 13 . .	...	1 ♂ W	2 ♀ W	3 ♂ 1 W + 2 W
Aug. 15 . .	...	1 ♂ W	...	...
Aug. 17 . .	...	6 ♂ 5 W	...	...
Aug. 22 . .	...	2 ♂ W	5 ♂ 1 W + 2 W 2 W -	1 ♀ W +
1907.				
Feb. 19 . .	...	...	...	1 ♀ <i>c.</i> W -
March 7 . .	...	...	...	2 ♂ 1 ♀ <i>c.</i> W -
March 8 . .	...	...	...	1 ♂ W
March 12 . .	1 ♂	...	...	1 ♀ <i>c.</i> 1 ♀ <i>t.</i>
March 14 . .	...	...	1 ♀ W +	♂ in cop. with ♀ <i>t.</i> W
March 20 . .	...	...	...	♂ in cop. with ♀ <i>c.</i>
March 23 . .	...	...	2 ♂	...
March 25 . .	...	...	1 ♀	...
March 27 . .	...	1 ♀	2 ♂ 1 W -	...
March 28 . .	...	...	...	1 ♀ <i>c.</i> W -
April 16 . .	1 ♀	...	...	...
April 17 . .	...	...	1 ♀ W	...
Totals . .	1 ♂ 1 ♀	10 ♂ 3 ♀	12 ♂ 4 ♀	9 ♂ 15 ♀

c = *cabiroides* ♀ form of *alicia* mimetic of *cabira* on under side.

t = *tenelloides* ♀ form of *alicia* mimetic form of the *tenella* form of *vinidia* on under side.

i = ♀ form of *alicia* intermediate between the above.

W + = wings considerably worn (not chipped or notched except very rarely).

W = moderately worn.

W - = little worn.

Specimens without W are fresh.

fined to the parts of the under surface which are visible at rest: they probably sub-serve Müllerian mimicry during repose. There can be no doubt that the resemblances in question are based on affinity: comparison between the *cabiroides* female form and *bonasia*, F., the western representative of *alicia*, makes this evident. But, at the same time, it is equally clear that in the presence of the British East African *cabira*, just those elements in the pattern have been retained, developed and modified, which would thereby promote resemblance during repose.

TYPE captured, March 28, 1907, at Weithaga, N. Kikuyu, British East Africa; in Hope Department, Oxford University Museum.

The *cabiroides* form was taken *in coitu* with the male *A. alicia* on March 20, 1907.

Acræa alicia, E. M. Sharpe, new female form *tenelloides*.

Distinguishing features are confined to the under surface which is alone referred to below. The under surface of this female form, which is apparently less abundant than *cabiroides*, superficially resembles that of the *tenella*, Rogenh. (= *abbotti*, Holland), form of *Acræa vinidia*, Hew., found abundantly in the same locality (Weithaga). As in *cabiroides*, the resemblance is confined to the parts of the under surface that are visible during repose. The sharp demarcation between the marginal markings and the paler ground colour is obscured by an over-spreading ochreous shade, producing an effect entirely different from that of the *cabiroides* form and its model, but somewhat similar to *tenella*, especially the females. The cream-coloured band crossing the hind-wing which is so conspicuous a feature in the *cabiroides* form, is here obsolete or invisible, being of a pale yellow tint like the rest of the disc. The marginal pattern is much reduced, the inner part with its bay, which is so characteristic a feature in *cabiroides*, being absent or only to be made out by careful examination. Thus reduced, the margin is only about half the width attained in the other mimetic female form, being of about the same proportion as in *tenella*, and like it with an internal contour nearly parallel with the hind margin of the wings, and with a bay which is slightly marked as compared with that of *cabira* and its mimic. The triangular yellow internervular markings which invade the border from the hind margin of the hind-wing resemble the similar orange

marks of *tenella*,—especially the female of this latter, in which the triangles are less prominent and less sharply defined. In *cabira* and in the most fully-developed *cabiroides*, these markings are of a cream tint and very conspicuous. In all characters hitherto mentioned except the overspreading ochreous shade the *tenelloides* form tends to assume the pattern of its own male, and it might be held that this and not the mimicry of *tenella* is the significance of the difference between the two female forms of *alicia*.

The pattern of the male is however extraordinarily sharp and conspicuous, while that of *tenelloides* is obscured and ill-defined, so that the two patterns, however similar they may prove to be on close examination, have an entirely different superficial appearance. Furthermore, the remaining important characters towards the base of the hind-wing diverge from the pattern of the male *alicia* and resemble those of *tenella*. The sub-basal black spots retain the appearance of a double row as in *cabiroides*, but are much reduced in size, while individual spots are lost, especially in the central or intra-cellular part of the series. The male, on the other hand, possesses an irregular single row of very heavily marked black spots, as well developed in the cell of the hind-wing as elsewhere. The points in which the band of *tenelloides* differs from that of its own male and from the other female form, bring about an approach towards the pattern of *tenella*, which can hardly be accidental. In both sexes of *tenella* there is an irregular double sub-basal row of small spots, of which the largest are a pair (one spot for each row) within the costal margin, while the most numerous form a group within the inner margin. Between these two extremities the rows are only represented by two spots in the cell, of which the outer is usually the more conspicuous and sometimes the only constituent. In the *tenelloides* form we also find the two prominent costal spots, the numerous small spots at the other end of the series, and the median reduction to one or two spots in the cell.

Tenella furthermore differs from *cabira* in the absence of a well-marked bluish-grey basal area within the sub-basal spots, a feature that is mimicked in the best developed *cabiroides* females and suppressed in the best developed *tenelloides*, where the area in question is, as in the model, rather darker than the rest of the under surface, but differs

from the model in the absence of basal orange marks, somewhat conspicuous against the yellow ground colour. *Tenelloides* appears to display more evidence of special adaptation and a smaller use of ancestral features in the attainment of a mimetic appearance, than *cabiroides*.

TYPE captured, March 12, 1907, at Weithaga, N. Kikuyu, British East Africa; in Hope Department, Oxford University Museum.

The *tenelloides* form was taken *in coitu* with the male of *A. alicia* on March 14, 1907.

These two female forms are probably specially developed in N. Kikuyu in relation to the abundance of *cabira* and *tenella*. I have not found the same sharp differentiation into two contrasted forms in the females from other localities which I have had the opportunity of studying. Very great variation in the under surface pattern of the females was however always evident; and even at Weithaga intermediate forms appear, while distinct traces of the *cabiroides* pattern, invisible at a little distance, can be made out on a careful examination of some of the *tenelloides* females.

E. B. P.

2. *The peculiar aposematic pattern of the under surface in the male Acræa alicia.* E. B. P.

The visible under surface of the male of this species and the allied *A. uvui*, Grose-Smith, possesses a remarkable and characteristic pattern. The ground colour and apical bar of the fore-wing are bright yellow, the sub-apical bar of the fore-wing and the border of both wings deep black, the border containing prominent yellow markings, developed along the hind margins of both wings. The sub-basal row of black spots of the hind-wing is so strongly developed as nearly to form a continuous band, within which the ground colour assumes a greenish tint. The effect of the simple pattern thus briefly described is very peculiar and unlike that of other *Acræas*. E. B. P.

3. *The synaposematic upper surface pattern of Acræa alicia, uvui, etc.* E. B. P.

Although the females are so different from the males on the under surface, that of *uvui* resembling the *fulvescens* form of *Acræa johnstoni* (see p. 516), the pattern of the upper surface is very similar in the two sexes. The females of

alicia and *uvui* are indeed distinguished from the males by the pale markings in the black hind marginal border, but in spite of this are indistinguishable upon the wing (see p. 529). Mr. S. A. Neave, M.A., B.Sc., has called attention to this upper surface aposematic pattern and has pointed out that *Aeræa vinidia* (*tenella*) possesses a very similar upper surface (Trans. Ent. Soc. Lond., 1906, p. 219). E. B. P.

d. *Pardopsis punctatissima*, Boisdl., as a model.

P. punctatissima is a very common widespread species in East Africa and there is generally associated with it a Lycænid, *Pentila amenaida*, Hew., and in other localities other species of the same genus. Both are woodland species, though the Lycænid prefers much more shady places than *P. punctatissima*. The latter is altogether duller in colouring and its flight is much nearer the ground.

When at Taveta I was much struck by the resemblance of a diurnal Geometrid moth, *Petovia dichroaria*, Herr.-Sch., which I took flying with *P. amenaida*, on December 9, 1905. The resemblance does not appear very strong in the cabinet, but on the wing the similarity of their flight and their general appearance is very deceptive, so much so that I have had difficulty in discriminating between the species in the living state. The moth is somewhat brighter in colouring than the Lycænid. *P. punctatissima* is commoner at Rabai than at Taveta, and *P. amenaida* is also abundant, but I do not remember seeing the moth.

P. amenaida gives one the idea of being itself protected. It is very fond of settling in little companies on low plants, and if disturbed often opens its wings a few times without quitting the surface on which it is resting. Its flight is very feeble indeed.

[Rabai, August 29, 1908.]

I have lately taken *Pentila amenaida* and *Pardopsis punctatissima* together. Many specimens of the *Pentila* are smaller with the spots fewer and smaller, so as to bear little resemblance to the *Aeræa*. Although the *Pentilas* are more addicted to forest country and the *Pardopsis* to grass-lands with patches of bush, they may be seen flying together. The *Pentila* is even commoner than the *Pardopsis*.]

1. *Further notes on the mimics of Pardopsis.* E. B. P.

It is probable that the Geometrid moth is a secondary Müllerian mimic of this specially protected Lycænid. Mr. Guy A. K. Marshall captured the same species at Malvern, Natal, flying with another distasteful Acraeiform Lycænid—*Alæna amazoula*,* Boisd. Four examples of the moth and three of the *Alæna* taken by Mr. Marshall, September 26, 1897, are now in the bionomic collection of the Hope Department. These specimens of the moth are much paler in tint, and possess far darker veins than the individuals from Taveta, of which a second was taken by Rev. St. Aubyn Rogers on December 26, 1905. These local differences in the moth correspond to obvious points of distinction between the *Alæna* and the *Pentila*, thus suggesting the conclusion that the two *Lycænidæ* act as models. A much larger number of specimens from both localities must however be examined and compared before this conclusion can be regarded as established.

There is no doubt that both these Lycænidæ are mimics of the *Acraeinæ*—the *Pentila* of *Pardopsis*, the *Alæna* of a general type of Acraeine colouring—thus supporting the opinion that the resemblance of the moth is a case of secondary mimicry. I found that both *Alæna amazoula* and *Pentila amenaida* had been placed among the Acraeas of the Hope Department by the late Professor Westwood. Unnamed and evidently unstudied they had been placed where almost any naturalist unfamiliar with their section of the *Lycænidæ* would have placed them if he had not the time to make a careful examination. E. B. P.

C. MIMETIC COMBINATIONS AMONG THE PIERINÆ.

I. *Mylothris-centred Combinations.*a. *Mylothris agathina-centred Combination taken at Rabai.*

The following specimens were captured at Rabai, June 23, 1906:—

Myl. agathina, Cram., ♂. See Plate XXIX, fig. 5, for under surface.

Belenois thysa, Hopff., ♀: dry f. See Plate XXIX, fig. 6, for under surface.

* Trans. Ent. Soc. Lond., 1902, pp. 497, 498.

Leuceronia argia, Fabr., ♀: dry f. See Plate XXIX, fig. 7, for under surface.

All the specimens were in good condition except the *Mylothris*, which was slightly worn. These species are all fairly common at Rabai and are found frequenting the same stations. *M. agathina* is, perhaps, more distinctively addicted to the open country, but all are found in woodlands, and *M. agathina* and *B. thysa* may frequently be seen flying together.

In this district the commonest species is *B. thysa*, though the association is probably grouped round *M. agathina*, which has the slow leisurely flight of a protected species.

B. thysa has a much more rapid flight when disturbed, but, like most of the members of its genus, it is frequently seen settled on flowers, and it is comparatively rare to find specimens which show evidence of the attacks of birds.

L. argia is more of a forest insect, and the flight of the males is high and strong. The female usually flies much lower and much less strongly than the male, so that it approaches the other two members of the combination in habits as well as in colouring.

[The mimetic resemblance, which is developed upon the under surface of the wings, is represented on Plate XXIX, figs. 5-7. The orange flush at the base of the fore-wings which is the distinctive feature of the male *Mylothris* and the females of the other two species, is distinctly shown in the plate. The mimetic likeness attained by the female *Leuceronia* (Fig. 7) is seen to be very rough as compared with that of the *Belenois* (Fig. 6). Furthermore, the orange flush of the *Leuceronia* resembles that of the *Belenois*, and more closely that of the *Mylothris*,—probably due to secondary mimicry; but many specimens must be compared before this suggestion can be accepted. It is of much interest to note that the primary model resembled by these two females is a male, the orange flush of the female *Mylothris agathina* being obscured by the general brownish-orange colour of the wings. E. B. P.]

b. *Mylothris agathina*-centred Combination from Kilimanjaro.

Myl. agathina, Cram., 1 ♀ (worn, a large notch in left fore-wing), Jan. 26-31, 1906.

Myl. poppæa, Cram., 1 ♀, Jan. 26-31, 1906.

Myl. yulei, Butl., 4 ♀, Jan 5-16, 1906.

Myl. rüppellii, Koch, 1 ♀, Jan. 5-16, 1906.

Pinacopteryx rubrobasalis, Say, 3 ♀, Jan. 5-16; one, Jan. 26-31; two, 1906.

With regard to the upper surface *M. poppæa* is much brighter orange than the others. The other species of *Mylothris* resemble one another and are approached by the palest of the three specimens of the *Pinacopteryx*.

On the under side the palest *Pinacopteryx* beautifully mimics the *M. rüppellii*, while the other two specimens of the *Pinacopteryx* mimic *M. agathina*, in which the ground colour of the hind-wing is ochreous. The *M. yulei* and *M. poppæa* resemble each other closely.

The predominance of the genus *Mylothris* in this combination is very evident, and there is no doubt that it is distasteful to some enemies, at any rate. All the specimens were captured for me by natives, as I was unable to go to Kilimanjaro at that time. When I was on the mountain in September I observed the abundance of this combination and obtained specimens of some of its members.

c. *Mylothris*-centred Combination from Weithaga.

The table on p. 538 represents all the specimens of an interesting Pierine combination captured at Weithaga in the Northern Kikuyu country, a part of the Kenia province of the colony.

The most dominant species is *Mylothris rubricosta*, Mab., which is found almost exclusively in swampy places, and is also very abundant. *M. rüppellii*, Koch, is also found commonly, but I do not remember having ever seen *M. agathina* in this part of the Kikuyu country.

Associated with these is found *Phrissura phæbe*, Butl., of which the under surface of the female bears most resemblance to *M. agathina* ♂, whilst that of the male is nearer to both sexes but especially the male of *M. rubricosta*. On the upper side the female of *P. phæbe* is,

WEITHAGA.	<i>Mylothris rubricostata.</i>	<i>Mylothris rüppellii.</i>	<i>Phrissura phæbe.</i>	<i>Pinacopteryx pigea</i> , N. form of.
1906.				
Aug. 15 .	3 ♂ 5 ♀	...	...	...
Aug. 16 .	8 ♂ 2 ♀ Anal angles of both H.W.s notched in 1 ♀.	...	...	...
Aug. 18 .	...	2 ♂ Left wings of both cleanly shorn.	...	...
Aug. 22 .	...	...	1 ♂ Chipped.	1 ♂ Chipped, and specially at anal angle H.W.
Aug. 23 .	1 ♂	1 ♂ Left H.W. shorn.	...	...
Aug. 24 .	...	1 ♀ Worn, rather chipped.	...	...
1907.				
Feb. 13 .	...	...	...	1 ♂
March 9 .	2 ♂	...	...	...
March 13 .	1 ♂	...	...	...
March 19 .	...	...	...	1 ♂ Rather worn.
March 23 .	...	...	...	1 ♂ 1 ♀ (normal) Rather worn.
April 5 .	...	...	...	1 ♂
April 13 .	1 ♂	...	1 ♀	...
April 20 .	...	...	...	1 ♀ (mimetic) Fresh, chipped.
May 11 .	2 ♂ 1 ♀ Anal angle of one H.W. notched.	...	...	...
May 13 .	1 ♂	...	...	...
Totals .	19 ♂ 8 ♀	3 ♂ 1 ♀	1 ♂ 1 ♀	5 ♂ 2 ♀

however, much nearer to the two species of *Mylothris* captured with it, but especially to *M. rüppellii*, because of the development of the black markings.

The most interesting species of the combination, however, is the single female of the northern form of *Pinacopteryx pigea*, Boisd., captured April 20, which is quite different from the normal form and distinctly mimetic of the section of the genus *Mylothris* of which *M. agathina* ♂ is the best-known example. On the under side the

resemblance is strongest to the male of this species; but on the upper the likeness to the two species of *Mylothris* actually taken with it, and especially *M. rubricosta*, is more evident. This remarkable female of *P. pigea* chiefly resembles the female of *M. rubricosta* in the indistinctness of the orange-red flush, whilst the slight black margin brings it nearer to the male of the same species.

This form of the northern *P. pigea* has not been taken hitherto, and is, in Dr. Dixey's opinion, perhaps transitional towards *P. rubrobasalis*, Lauz.

It would be of considerable interest to ascertain whether this mimetic female is a seasonal form, and whether it is to be compared with the special development of mimicry in the dry season phase of *Belenois thysa*, as described by Dr. F. A. Dixey.* The seasons are not however well marked in Northern Kikuyu, and the country never reaches the parched state which seems necessary for the full development of the dry season phase of most *Pierinæ*.

It will be observed from the table on p. 538 that several specimens show injuries probably caused by the attacks of birds, and that this evidence is stronger in the case of *M. rüppellii*, although a model, than in that of the mimetic species. The cleanly shorn hind-wings of more than one specimen of *M. rüppellii* especially afford very strong evidence of attacks by such a weapon as the beak of a bird.

The great predominance of Pierine mimicry within and convergent towards *Mylothris* is well seen in the tabulated Weithaga specimens; for the only other Pierines captured at the same period in this locality were:—

- 1 *Belenois mesentina*, Cram.
- 6 *Synchlœ johnstoni*, Crowley.
- 2 *Terias brigitta*, Cram.
- 3 *Terias regularis*, Butl.
- 2 *Terias senegalensis*, Boisd.
- 3 *Colias electra*, Linn.

II. *Belenois-centred Combination from Taveta.*

Dr. Dixey has brought forward much evidence to show that *Belenois thysa* is a protected species, and, to judge from their abundance, it would seem that *Belenois severina*,

* Proc. Ent. Soc. Lond., 1906, pp. xxxvi, xxxvii.

Cram., and *B. mesentina*, Cram., should be regarded in the same light.

Whilst at Taveta it seemed to me that these two species formed a centre of convergence for other *Pierinae*. On May 10, 1905, the following were captured:—

- B. severina*, Cram., ♀.
Teracolus halimede, Klug, ♀.
Teracolus celimene, Lucas, ♀.
Abantis levubu, Wallgr., ♂.

All these species bear a considerable resemblance on the wing, and all settle in exactly the same way with wings half raised. I think *Teracolus castalis*, Staud., might be added to the assemblage. The convergence is greatest between the ♀ *T. celimene* and the ♀ *B. severina*, and I have little doubt that the *Belenois* has acted as a model in this case. The other two species are more like the males of *B. severina* and *B. mesentina*; and though in mounted specimens it may not seem very evident in the case of the *Teracolus* still it is very appreciable in nature. The Hesperid is of great interest, as mimicry in this group is so rare. The species has a rapid flight as is usual in this family, but its comparatively large size and its conspicuous black and white colouring mark it out at once from its congeners and give it a strong superficial resemblance to the forms mentioned above.

Teracolus has a habit of congregating in special places to roost every evening, generally several species being present at one and the same place, with the two common species of *Belenois*. These places are generally exposed to the rays of the sun as it sinks in the western horizon, and the same situations are used for months and even years.

[Rabai, Aug. 29, 1908.]

As the rest attitudes of all butterflies are of some importance, you may be interested to hear that I twice saw *Belenois thysa* in the position of permanent rest. In one case a single shattered specimen was observed resting on the under side of the leaf of a small tree where it was well concealed, but two other specimens (quite fresh) were seen resting on the upper side of the leaves of a small bush in the forest with bright green leaves, against which the yellow under side was most conspicuous and could be

visible from some distance. At this time of the year very few butterflies are on the wing before 7 o'clock, whilst the early morning hours are a time of great activity for birds.]

[Rabai, Aug. 29, 1908.

Some of the smaller *Acræas* are anything but conspicuous on the under side,—even *A. encedon* which is so abundant and widely distributed. It is no doubt an advantage to them to be fairly well concealed in the position of complete rest.]

1. *Resemblance between a female Teracolus vesta and a female Belenois severina taken together at Taveta.*
E. B. P.

When looking over the *Pierinæ* captured by the author at Taveta, I noticed a female specimen of *Teracolus vesta*, Reiche (represented on Pl. XXIX, fig. 9), which strongly suggested the facies of the female of *Belenois severina*. When I turned to the series of this latter species, it was at once seen that on the very day (April 25, 1905) on which he had captured the *Teracolus*, a female *severina* closely resembling it had also been taken. The specimen is figured on Pl. XXIX, fig. 8. The pale salmon tint which usually appears on *T. vesta* is wanting from the upper surface of this specimen, of which the ground colour is a very pale greenish-yellow like that of the *Belenois*. The oblique black marking which starts from the costa of the fore-wing and crosses the end of the cell is strongly developed in the *severina*, closely resembling the *Teracolus*, in which it is a characteristic feature of the upper surface. Beneath, the yellow and orange tints and dark markings are very different in detail, but their general effect is the same. On the wing and at rest from a little distance, the butterflies would be indistinguishable. E. B. P.

D. NOTES ON THE SEASONAL FORMS, ETC., OF PRECIS IN BRITISH EAST AFRICA.

[This section is chiefly made up of quotations from letters by Rev. K. St. Aubyn Rogers, and noted on the specimens presented by him to the Hope Department.

E. B. P.]

a. Precis sesamus, Trim.

Rabai, Sept. 30, 1906.

I should have mentioned that I found *Precis sesamus* in Kikuyu (I had a month there during August 1906). All the specimens I took were the dry form, which is what one would expect; but I saw the wet form once. This year has been very wet in Kikuyu as well as at the coast, but the rains stopped in Kikuyu early in June, and I was there in the Dry Season: still the country was not at all dried up and the grass was still green. I doubt if it does dry up at this time of year in normal years. I also found *Precis archesia*, but those were all of the "wet" phase, which is rather extraordinary.

Plymouth, Jan. 3, 1907.

I do not think I have ever sent you the list of captures of *Precis sesamus* in North Kikuyu [Weithaga]. I have no record of those taken in Aug. 1906 [see preceding letter], but those of 1907 are as follows:—

1907.	DRY-SEASON FORMS.	WET-SEASON FORMS.
Feb. 16	1	3
Feb. 19 . . . . .	...	1
Feb. 22	1	1
Feb. 26 . . . . .	...	1
March 4 . . . . .	...	2
March 5 . . . . .	...	1
March 11	1	...
March 19 . . . . .	...	2
March 23 . . . . .	...	2
April 2 . . . . .	...	1
April 5	1	1
April 6	1	...
April 8 . . . . .	...	1
April 12 . . . . .	...	1
April 19 . . . . .	...	1
April 20 . . . . .	...	3
April 22 . . . . .	...	1

[The following list of Rev. St. Aubyn Rogers' captures at Weithaga differs in a few details from that given by him. The dates recorded below were copied from the "papers" in which the specimens were enclosed,

WEITHAGA.	DRY-SEASON FORMS.	WET-SEASON FORMS.	REMARKS.
1906.			
Aug. 9 . . .	1 C	...	...
Aug. 15 . . .	1 W C	...	...
1907.			
Feb. 16 . . .	1	2 1 W -	...
Feb. 18 . . .	...	1 W + C +	...
Feb. 22 . . .	1	1	The right hind-wing of dry form cleanly shorn as if by bird's beak.
Feb. 25 . . .	...	1 W + C +	...
March 4 . . .	...	1 W + C	...
March 5 . . .	...	1 W	...
March 19 . . .	...	2, 1 W + C +	The worn specimen is transitional towards the dry form: the other a fine fresh specimen.
March 23 . . .	...	2 W + C +	...
April 2 . . .	...	1	A very fine fresh specimen.
April 5 . . .	1 W C +	1 W - C -	Both hind-wings of dry form shorn cleanly and symmetrically as if by a bird.
April 6 . . .	1 C +	...	...
April 8 . . .	...	1	...
April 12 . . .	...	1 W C -	...
April 19 . . .	...	1 W + C +	...
April 20 . . .	...	2, 1 W -	...
April 22 . . .	...	1 W + C + 1	...

The indirect evidence of injury inflicted on fresh or not greatly worn dry-season forms by birds, when the wet individuals so often exhibited strongly marked indications of ordinary wear and tear, may throw light on the bionomic value of the pattern of the phase to which the latter belonged.

E. B. P.]

Rabai, July 1, 1908.

I have been up country again and have one more small contribution towards the elucidation of our old friend, *Precis sesamus*. I was at the Mukaa Hills, about 30 miles E. of Machakos, in the second week in June. You will perhaps remember that Hinde took about equal proportions of the two forms a little earlier than this at Machakos in 1900. The present season has been marked by deficient rainfall, and the heavy rains did not begin till April 20, which was very late.

The rainfall at Machakos for the first five months of 1900 and 1908 is quoted below, extracted from the Meteorolog. Records of the Agricult. Dep., B. E. A. :—

	1900.	1908.
Jan.	8·17 in.	0·80 in.
Feb.	8·10 in.	0·74 in.
March	10·15 in.	1·45 in.
April	5·43 in.	5·35 in.
May	5·89 in.	2·81 in.

The result of this late commencement in the present year is well seen in the series I have taken. *P. sesamus* was very common, but I only saw *one* dry form, which I took—a very fresh specimen. All the remainder, in all stages of freshness, were *Wet*, though one is a little intermediate. I think this is very remarkable, and may have some bearing on the stimulus. I should say that Mukaa is a dry place, and very open with little bush even. I searched the lower valleys and in the very sparse woods, but the single specimen was the only one I saw.

[The specimens obtained by Mr. and Mrs. S. L. Hinde are quoted below from Trans. Ent. Soc. Lond., 1902, p. 447, etc.

Machakos Road, May 22, 1900.—Twelve *P. sesamus*,—6 wet, mostly worn; 6 dry and fresh.

Machakos, June 6, 1900.—Six *P. sesamus*,—2 wet; 1 on the wet side of intermediate; 3 dry. All were fresh except one of the wet forms.

The comparison with Rev. St. Aubyn Rogers' captures is very striking, and the specimens collected by the same naturalist on Kilimanjaro in the autumn of 1905 should also be compared. See Proc. Ent. Soc. Lond., 1906, pp. lviii, lix, where the capture of many dry forms and a single wet is recorded. The latter, a fresh male, was taken Sept. 22, *in coitu* with a slightly worn and much torn dry female. The dry forms were mostly worn.

E. B. P.]

b. *Precis antilope*.

Rabai, 1906.

I spent a day or two in Taita on my way down, but the weather was not good, and I got nothing except on the march in to Voi, when I captured, among other things, the wet-season phase of *Precis antilope*,—the only example

I have seen * and one which may throw some light on the causes of the seasonal change.

The season should normally have been in the very height of the shorter dry season. But the seasons there are somewhat uncertain. Normally the smaller wet season is almost confined to November in Taita; after which comes the hottest and driest part of the whole year when insect life is at a minimum. The greater rains normally come about the middle of March or later. This year [1906] the rainfall in the latter rains was heavier than usual and lasted till much later. Moreover, there was heavy rain (5 inches or more) during the first week in February and I got the wet phase of *P. antilope* on the twelfth.

The falls are very local in these latter rains, and some places in Taita have suffered from a great deficiency of water, even this year, whilst in Taveta 50 miles away we hardly had any rain at all.

c. Precis archesia, wet-season form pelasgis. E. B. P.

The collection of this interesting and puzzling species from Weithaga was made during the following months:— 1906, August (7 specimens); 1907, February (2 specimens); March (4 specimens); April (4 specimens); May (1 specimen). It is not necessary to record the precise dates; for the whole of these, together with 7 Weithaga specimens, bred Feb.–April 1907, are of the wet form *pelasgis*, although falling short to a varying extent from the full wet forms of southern Africa.

Five eggs laid, Feb. 24, 1907, by a female on the wild food-plant were collected, although the parent unfortunately escaped. It was however a typical British East African wet-season female. The following table shows the very uniform length of the stages in the 5 individuals:—

EGG LAID.	HATCHED.	PUPATED	EMERGED.
1907.	1907.	1907.	1907.
Feb. 24	March 5	April 1	April 16
Feb. 24	March 5	April 1	April 16
Feb. 24	March 5	April 1	April 17
Feb. 24	March 5	April 2	April 18
Feb. 24	March 5	April 2	April 18

* The Hope collection contains a wet phase *antilope* captured by the author at Taita on May 26, 1905.

Two ova, of unknown parentage, were also found on the food plant. The larvæ which hatched from them pupated on April 5, an imago emerging on April 20, the other on the 21st.

These 7 bred specimens appear on the whole to show the *pelasgis* (wet) characteristics rather less fully than the majority of the captured specimens. This is especially true of the last-mentioned specimen, which emerged on April 21st. A comparison with the captured specimens renders it probable that these very slight differences are merely the result of artificial conditions, and do not indicate any tendency towards the development of the dry phase during April.

The chief character in which these more northern *pelasgis* approach *archesia* and fall short of the development attained by the wet-season forms in southern Africa is the usual grey-mottled appearance of the dark ground colour on the under surface, especially noticeable in the basal halves of both wings. In southern specimens, on the other hand, this dark ground colour is uniform and patternless. In other less striking features the northern forms appear also to approach *archesia*, but an account of them is postponed until a long series of southern specimens has been carefully examined from this point of view. In the meantime there is no doubt about the general existence of the important difference described above, and it is probable that the appearance of intermediate characters in the northern *pelasgis* may throw light on the evolution of the most completely specialised and contrasted seasonal forms of the species.

E. B. P.

d. *Habits of Precis natalica and P. elgiva.*

Rubai, Sept. 30th, 1906.

I see [in Trans. Ent. Soc. Lond., 1902, p. 423] that in S. Africa *Precis natalica* and *P. elgiva* are both described as forest butterflies. This is not the case here. *P. natalica* is common at Mombasa even in parts of the island where there is no wood at all, and the scrub is not more than 8 ft. or 10 ft. high, and I found *P. elgiva* in N. Kikuyu where woods of any size are few and far between, and there is nothing that could be called forest anywhere near.